agriculture

Vol. 76 No. 10 October 1969

Published for the Ministry of Agriculture, Fisheries and Food
by Her Majesty's Stationery Office

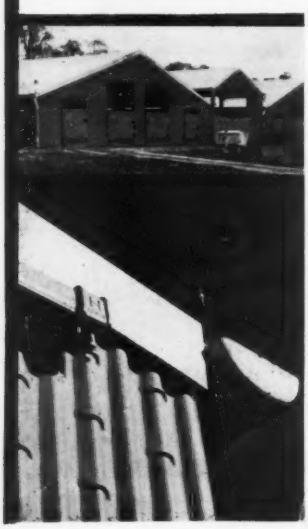
1s. 3d.
MONTHLY

Co-operation in Lamb Marketing page 483

New strong steel sheet roofing and cladding gives INEXPENSIVE COLOUR PROTECTION

Durable, attractive, maintenance-saving colour – plus the strength of corrosion protected steel – AT LOW COST. BSC's colour-coated 'Everclad' gives you a choice of fresh, appropriate farm colours. This modern galvanised steel product provides excellent appearance, durable colour finish, and long-term protection for farm buildings at lower cost than has been possible before.

Prime-painted 'Galvaprime' is a BSC pre-coloured, fully-galvanised steel sheet which gives protection very cheaply, saving *initial* site painting costs. Experience shows that these modern pre-coated steel claddings actually cost the farmer less than if he specified other materials and site painted them using his own labour!



Shatterproof and more resistant to damage in transit, fixing and service, colour-coated steel sheet adds strength and value to farm buildings. Unlike other cladding materials, it is light, needs less structural support and is less likely to damage.

Better looking—better protection. Stronger and more quickly fixed, long and easily handled lengths of pre-coated steel sheet are available so that costs are cut further by minimising overlaps.

Durable coatings. Thick PVC coating or specially formulated paint is applied under controlled conditions assuring excellent adhesion to the fully galvanised sheet. Uniformity of coating and finish are far superior to site painting. **Important — Everclad colour-finished steel claddings are approved for Ministry grant. COLOUR RANGE. Specially chosen colours approved by CoID and MAFF help buildings blend with rural settings.**

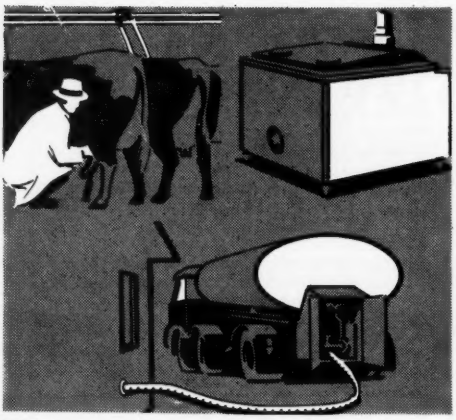
'EVERCLAD' colours—Lakeland brown, Peak grey, Evergreen.

'GALVAPRIME' is available in Country Green

Top left. Maintenance-saving colour. This 'Farm-Pak', 120-cow cubicle building has wall cladding in 'Everclad' plastic-coated galvanised steel sheet. Farm labour can erect low-cost light tubular steel frame Farm-Pak structures. (Farm-Pak Buildings Ltd., Southampton.)

Centre. Attractive. Buildings shown are similarly clad in plastic-coated galvanised steel: the 300-cow 'Cotel' is by Hill Construction Co. (Engineers) Ltd.

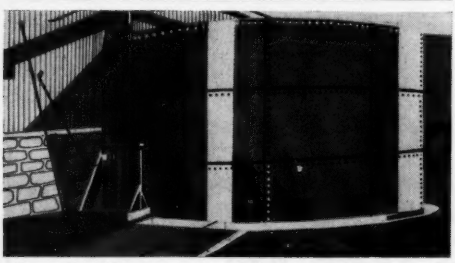
Bottom left. Low-cost colour plus ventilation. 'Ventrex' louvred steel sheet in pre-painted 'Galvaprime' gives weather protection plus ventilation. Air gets in, rain and snow stay out—there is no condensation. Ventrex sheet by Ash and Lacy Ltd., Warley, Worcs.



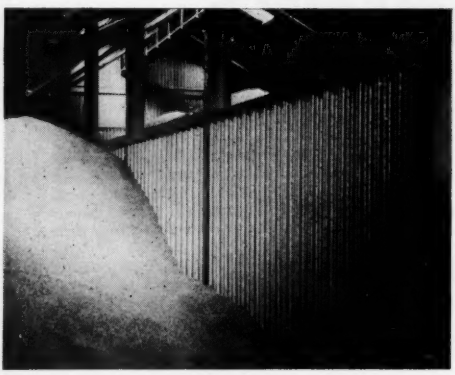
Design in steel

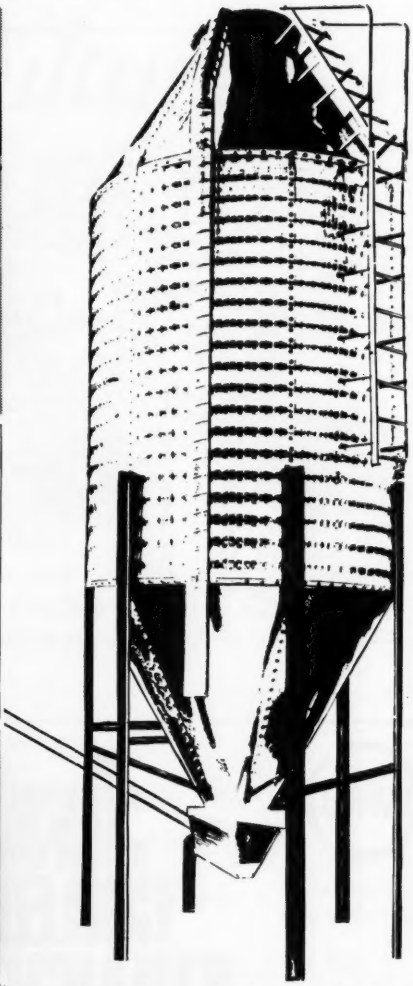
Stainless steel. Bulk milk tank and dairy equipment – for ease of cleaning, hygiene, high strength, in labour-saving milking parlours.

Modern structures that save farm labour



Above. Steel Slurry Tanks–simplify disposal, save labour, built of corrosion resistant vitreous-enamelled steel sheets – which is also used in steel silo machinery. (Boythorpe Cropstores Ltd.).





Top right. Modern pre-fabricated steelwork – keeps costs down. These galvanised all-steel Bulk Feed Tanks for bulk storage of animal food stuffs can be delivered ready to the prepared farm site to save labour and feeding costs immediately, for poultry, pig and dairy producers. (Spiraflite Ltd, Potton, Sandy, Beds.) Main opening page illustration: Economical steel portal frame building with galvanised storage walling – clear spans up to 120 ft or more are not unusual. (Boulton and Paul, Steel Construction, Ltd, Norwich).

Bottom left. Stronger – multi-corrugated galvanised 'Arcform' panel system for side walling or internal partitioning. Sheet is 38 times stiffer than normal profile. (Frederick Braby & Co Ltd, Bristol 3 – who also supply grain bins as shown on opening page).

Information. Building? Or modernising? We will gladly supply details of relevant steel products for farm structures and a list of erectors of modern, steel-framed agricultural buildings.

British Steel Corporation

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Agriculture

VOLUME 76 . NUMBER 10 . OCTOBER 1969

Editorial Offices
Ministry of Agriculture, Fisheries, and Food
Whitehall Place, London S.W.1.

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AGRICULTURE OCTOBER, 1969

50th Anniversary

The Welsh Plant Breeding Station

Llywelyn Phillips

THIS year marks the fiftieth anniversary of the Welsh Plant Breeding Station which was established in 1919 as a research department of the University College of Wales, Aberystwyth, through the munificence of the late Lord Milford, Llanstephan House, Llyswen, Brecon. During the early years the Station received other private donations towards its maintenance and expansion, together with grants from the Ministry of Agriculture and Fisheries and the Empire Marketing Board. In the course of time the Station became wholly maintained by Ministry grants until 1956, when the responsibility for financing state-aided agricultural research institutes was transferred to the Agricultural Research Council.

The Founder-Director, Sir R. George Stapledon, relinquished his post in 1942 and was succeeded by the late Professor T. J. Jenkin who had been the senior research officer at the Station since 1920. Upon his retirement in 1950, Professor E. T. Jones was appointed Director and in 1953 the present

headquarters were established at Plas Gogerddan, three miles north of Aberystwyth. The present Director, Professor P. T. Thomas, was appointed in 1958.

The experimental grounds at Plas Gogerddan extend to 365 acres, together with laboratories and glasshouses, for conducting basic studies on the techniques of plant breeding and for the production of nucleus seed stocks. breeders' seed of grass varieties, and basic seed of winter and spring oats are grown at Morfa Mawr, a farm of 460 acres on the coast of Cardigan Bay, 12 miles south of Aberystwyth. Hill land investigations are conducted at upland centres in north Cardiganshire and at Pant-y-dwr in Radnorshire, and a small centre for plant selection in a low rainfall area is maintained at Acton Pigott near Shrewsbury.

Over the past fifty years fundamental and applied researches have been conducted at the Station on plant breeding and crop production problems, and this work has been a valuable contribution to British agriculture and to agricultural research in many parts of the world.

Herbage breeding

From the outset the Station has devoted the major part of its research programme to grassland improvement based on the breeding of new varieties of grasses and clovers of superior leafiness, nutritive value and persistency in the sward. Fifty years ago this was an entirely new approach, since prior to the establishment of the Station practically no investigational work had been carried out on the breeding systems of herbage plants. In the early years at Aberystwyth extensive pioneer studies were carried out on the flowering habits, vigour, and degree of cross-fertility and self-incompatibility in grasses and clovers, together with the identification and evaluation of contrasting plant types within herbage species. Techniques had to be developed for the artificial hybridization of these plants and the protection of parents and progenies against foreign pollen.

In 1919 it was almost impossible to establish a productive and persistent grazing sward by reseeding. It was known, however, that individual fields on particular farms in different parts of the country had remained productive for generations, and these pastures were found to contain a high percentage of perennial ryegrass, cocksfoot, timothy, meadow fescue and white clover. Fields of this nature in many parts of Britain provided the material for the Station's early plant introduction plots.

When grasses from the different locations were set out as single plants, it was found that each species exhibited a wide range of variation in growth habit and seasonal production. These single plant studies provided an excellent method for assessing the potential value of plant types and for screening basic material for selection in a breeding programme.

Progenies of selected indigenous plants were assessed and found to be vastly superior to their 'commercial' counterparts in leafiness and persistency, and these plants formed the basis for the breeding of the Aberystwyth varieties of grasses and clovers. The immediate and sustained success achieved by varieties such as S.23 perennial ryegrass, S.48 timothy and S.100 clover, indicates the value of the scientific herbage plant breeding techniques developed and used at the Station. Moreover, the significance of this early work is reflected in the use made of these methods by research workers in all parts of the world.

Over the years the search for new plant forms has extended beyond the shores of Britain, and the present plant introduction areas include material collected from almost every country in Europe. Recent investigations, conducted by the Station's plant breeders in close collaboration with their colleagues in developmental genetics, chemistry, cytology, physiology and plant pathology, have shown that herbage plants can be further improved through the breeding of varieties with increased total and seasonal productivity, higher nutritive value and a greater efficiency in converting solar energy into food energy.

Varieties of ryegrass are now being developed which produce up to 25,000 lb of dry matter per acre, representing well over 3,000 lb of protein. With the efficient utilization of varieties of this kind by adequate fertilization and high stocking rates, farmers can produce around 1,500 gallons milk per acre. The Station is also accepting the challenge of an equally efficient beef production by paying particular attention to the importance of mineral as well as organic constituents in the development of new varieties.

Cocksfoot, which is going out of favour, is not entirely forgotten by the breeder, and it may not be too difficult to produce varieties which are as digestible as ryegrass, with the added advantage of being minerally more efficient. Further, the winter growing characteristics of a non-hardy Portuguese diploid cocksfoot have been successfully combined with the winter hardiness of S.37 cocksfoot, while another experimental cocksfoot variety, obtained by crossing S.37 with a Mediterranean species aims to combine the high productivity of the former with the more succulent leaf characteristics of the latter to increase digestibility and acceptability to stock.

Another landmark at the present stage is the introduction of hybrids at the tetraploid level which combine the good characteristics of Italian and perennial ryegrass, especially for productive short-term leys.

Intergeneric hybrids have been produced between Italian ryegrass and tall fescue, and the aim is to combine the superior seedling establishment and seasonal growth pattern of the one with the winter hardiness and persistency of the other. Trials are in progress with these hybrids to assess their performance under grazing and conservation conditions, and also to evaluate their seed production capabilities.

In clover breeding the aim is to breed higher yielding and more vigorous varieties which have a longer season of growth and can successfully compete with grass under high levels of nitrogen, and possess a higher symbiotic efficiency under such conditions. A new variety of white clover which is higher yielding, more persistent and more aggressive in grass/clover mixtures than S.100, is being multiplied for release. An early variety of broad red clover is also being multiplied for release, and results of trials show that it has a greater persistency than the standard varieties of this type and that it also has considerable resistance to clover eelworm.

Arable crop breeding

The work of the Station on arable crops has been concentrated mainly on the breeding of new varieties of winter and spring oats. The three most recently released varieties of winter oats, Padarn, Peniarth and Pendrwm, succeed other well-known Station-bred varieties, such as S.147, S.172 and Powys. A new mildew resistant spring oat variety, Mostyn, is at present the highest yielding variety available in Britain.

In recent years new varieties of winter beans (Daffa), winter rye (Rheidol), and a club root resistant rape (Nevin) have been released, and considerable progress has been achieved in the production of improved varieties of kale and fodder radish. A new variety of spring barley has also been developed which is resistant to specific races of mildew and to the majority of the cereal cyst nematode pathotypes found in Britain.

Herbage seed production

It became necessary to develop techniques for the successful multiplication of leafy herbage varieties through several generations in order to supply sufficient quantities of seed for distribution by seed merchants for the use of farmers. Herbage seed production techniques developed at the Station in collaboration with the National Institute of Agricultural Botany, seed growers and seed merchants, defined the essential sequence in the multiplication of grass and clover varieties and gave rise to certification schemes which assured that authenticated seed of the Station-bred varieties would be available for use on farms.

An increasing use is made of the 'S' varieties of grasses and clovers, and at present these constitute approximately 40 per cent of the total seed used in Britain. The Station provides regular supplies of breeders' seed of all its varieties for the production of basic seed by the National Seed Development Organization to meet the needs of growers of certified seed. Research into herbage seed production has resulted in the evolution of cultural, manurial and management techniques best suited for seed production on a field scale, and studies on post-harvesting conditioning of seed have provided satisfactory storage procedures for seed growers and merchants.

Grassland studies

Grassland studies at the Station have always been closely associated with the herbage breeding programme, and varieties are evaluated at all stages in their development in order to ascertain the optimum management for maximum animal production. Particular attention is given to the assessment of the nutritive value of the herbages, and laboratory determinations of quality and intake characteristics of the feeds are related to animal trials.

The scope and character of this work is reflected in the number of the Station's publications, both as specific articles in agricultural journals and in comprehensive bulletins which incorporate the results of grassland trials conducted under a wide range of climatic and management conditions and on various soil types from sea level to marginal and hill land.

Pioneer studies on hill land improvement have been conducted by the Station since its inception, and this work, particularly at the Cahn-Hill Improvement Scheme in the 1930s, has provided valuable guidance for the better utilization of upland areas. In Wales alone over 150,000 acres have been reclaimed by ploughing and reseeding during the period 1952–1967. Current hill land studies deal in particular with the limitation of production due to soil and climate, and the role of fertilizer N and white clover in relation to the requirements of different soil types for the establishment and maintenance of improved swards.

This article has been contributed by **Llywelyn Phillips, B.Sc.,** a Scientific Liaison Officer at the Welsh Plant Breeding Station.

The author discusses the formation of a lamb marketing enterprise in Devon.

Co-operation in Lamb Marketing

P. R. J. Ellis

In January, 1967, a meeting was organised by the local N.A.A.S. entitled 'Can Sheep Pay', at which Mr. R. Cawthorne, General Manager of North Devon Meat Ltd., told farmers what *his* section of the meat trade would like them to produce. He particularly emphasized the need for light-weight lambs (up to 44 lb carcase weight) of good quality *and* more early lambs on offer from April to June.

This meeting was organized to interest farmers keeping a wide range of breeds and with low financial returns from sheep. The main object was to explore methods of marketing which would raise their income from sheep without changing their techniques in management, as sheep are a minor enterprise on their farms.

Following this meeting a group of seven farmers explored in detail the possibilities of marketing their lambs co-operatively. This group decided that the conditions attached to the new grants for agricultural co-operation were more binding than they were prepared to accept, and that the initial finance required could be found by the seven without any great sacrifice if it was decided not to proceed with the venture.

One of the first steps taken by the group was to invite a further five farmers to join the investigation, mainly to increase the number of lambs to be marketed. One of the five subsequently withdrew from the group.

The group, through the N.A.A.S. Regional Co-operation Adviser, was fortunate in being able to consult the Chairman of another lamb marketing group on the functioning of that group over the past five seasons. It was this man's enthusiasm for co-operative marketing, as much as the details of financial gain, which convinced the group that it would be worth their while to 'have a go'.

A tape recording of this meeting proved of great value because firstly, members who had been unable to attend the meeting were able to hear what had been said at first hand and, secondly, it provided an accurate record without notes having to be taken during the meeting.

Background information

The majority of flocks in the Lifton area of west Devon are relatively small, about 150 ewes, as are the farms, which are mainly in the 100–300 acre category. Although sheep are very much a subsidiary enterprise, flocks are

to be found on a very large number of farms. The type of ewe varies from Dorset Horn to Clun and from Devon Closewool to Devon Longwool with many intermediate crosses.

N.F.U. help

The N.F.U. marketing division was consulted whether a limited company or a friendly society should be formed and then their package deal for the formation of a company was used, thereby keeping down legal costs.

During the discussions, a local accountant, a personal friend of one of the founder members, was consulted on various aspects of company law and, subsequently, this accountant was asked to become the company secretary. This accountant's office is also the company's registered office and his firm has been appointed the Company's auditors.

Abattoirs

Founder members explored all seven local abattoirs as potential outlets for their prospective 3,000 lambs to see which would, as well as paying a good price, feed back information on carcase quality so that this information could be used to assist members in improving their product.

On the basis of these investigations the group decided to sell their lambs, in their first year of trading, to North Devon Meat Ltd., a local farmers co-operative. This necessitated taking out a £10 share in this co-operative. The company slaughters stock in its new abattoir at Torrington and sells direct to supermarkets and chain stores (only a small proportion of the total carcases are sold on the Smithfield Market).

Left to Right
H. Vigars (Director) of Lifton Lamb Ltd. D. Brookham (Vice-Chairman) of Lifton Lamb Ltd. R. Cawthorne (N. Devon Meat Ltd.) F. Rowe (Chairman) of Lifton Lamb Ltd.

Directors

All the founder members were asked if they wished to become directors of the company and only eight agreed to do so. A chairman and vice chairman were elected from these eight and the others were delegated to organize secretarial work, finance, a rota to inspect the slaughtering of members' lambs, publicity and collective purchase of pharmaceuticals.

Membership

The membership of the company comprises Devonians and 'newcomers', and youthful ideas have been combined with experience. Before the meetings very few of the members knew one another well, if indeed at all, but they nearly all had one thing in common in that they were non-attenders at markets.

Despite the fact that one member has moved out of the area and that another has gone out of sheep production, the company is more than meeting its first year contract obligations. These were to market 3,000 lambs ($\pm$ 10 per cent), rationalize the collection of lambs, and market a specified proportion of the total lambs before the end of June.

During the year the members of the company have got to know one another and trust has been built up so that all discussions are now very frank. This has helped greatly in cementing the loyalty of the individual members to the company.

At a recent meeting, the directors discussed applications for membership from other local farmers on the basis of their breed of sheep and carcase grading achieved in 1968, where this information was available. The farmers who have been accepted for membership as from 1969 will be invited to purchase two £1 shares in Lifton Lamb Ltd: this is the maximum share holding for any member and it entitles him to one vote. If the demand for membership grows considerably the company will have to consider subdividing into 'cells' of about twenty members. However, there would still be only the one contract between the company and its market outlet. Too rapid an expansion of the company would also present other difficulties, not least of all that of maintaining loyalty, which is essential in such an enterprise.

Choosing a name

The directors decided on the name Lifton Lamb Ltd., because it was simple to say, stated the business of the company and where it was centred.

Marketing secretary

The daughter of one of the directors agreed to act as the marketing secretary, working for the group during her lunch hour. It was agreed to pay her a nominal wage for six months, and to review this in the light of experience.

Aims

One of the company's aims was ultimately to improve the price obtained per lamb by improving the quality of their product. This is to be done by analysing grading returns from the abattoir to ascertain which breeds or crosses produce the type of fat lamb commanding the highest price. The formation of the company meant that grading information was obtained for 3,000 lambs, which was considerably more than would have been available on any particular farm.

The company also hoped to be able to rationalize the haulage of lambs, thereby reducing costs, and as members farm within a ten mile radius of Lifton this has been feasible. In the future the company anticipates savings in the purchase of ewe replacements, rams and pharmaceuticals by collective buying.

Operation

A member who has lambs ready for slaughtering telephones the marketing secretary and is quoted the lamb prices for the following week. These prices are calculated and published as a forward price list by North Devon Meat Ltd. The secretary then books the lambs in at the abattoir, which then advises the farmers of the date and time of collection. It is fortunate that this year the abattoir is also the haulier, consequently, only one 'phone call is required. Payment for the lambs, according to their grading, (Q, A, B or reject), is made direct to the farmer by the abattoir after deductions to cover haulage, insurance and 3*d.* per lamb administration charge have been made. The latter is paid in a lump sum to Lifton Lamb Ltd. to cover administrative costs, which are a small wage to the marketing secretary, her telephone bill and a small sum to cover stationery and postage. Only a small amount of money passes through Lifton Lamb Ltd. so a very simple balance-sheet suffices.

As with any co-operative, North Devon Meat Ltd. is a non-profit making concern, but if there are any profits they are paid out as a bonus to all shareholders in proportion to the number of stock sold.

Where members of Lifton Lamb Ltd. are not also members of North Devon Meat Ltd. they are still entitled to the bonus paid by North Devon Meat for the lambs which they have marketed, because Lifton Lamb Ltd. has taken out membership in North Devon Meat Ltd.

Future

The members hope to learn even more from carcase evaluation during the next year so that improvements can be made in the quality of their product. In this first year there has been no clear-cut picture to indicate which breed or cross consistently produces the best quality lambs.

Flock recording, using records prepared by the N.A.A.S., is to play a part in more detailed evaluation of present flock potential and of the managerial ability of each member.

The discussion group has met once a month during the winter to examine in detail various aspects of management, i.e., sheep diseases and nutrition, flock recording and carcase grading.

Summary of benefits realized

There have been no miraculous short-term gains but during the first year the members have had several advantages over their previous year's trading.

1. They had no market fees to pay.
2. Savings have been made in haulage costs.
3. Marketing can be done by the occasional 'phone call.
4. Grading information has been collected for all members' flocks.

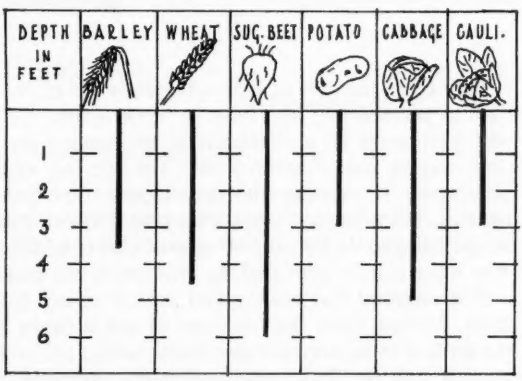
It must be emphasized that this is the picture after the first year of operation only. However, there have been other developments which would seem to justify an optimistic view of the group's future. Firstly, two members have formed a silage syndicate and, secondly, other members have been exploring the benefits which might accrue from either bulk buying of concentrates or milling, mixing and cubing their own.

This article has been contributed by **P. R. J. Ellis, B.Sc. (Agric.)** who is District Agricultural Adviser for the Lifton District of West Devon.

A sound design carried out with good workmanship, under dry conditions, will result in an efficient underdrainage system only if it is maintained properly. The author, R. H. Miers discusses the

Development of Underdrainage Design (Part 2)

A healthy environment for the roots of farm crops is one containing air, an adequate supply of moisture available to plant life, and the necessary nutrients. The greater the depth of soil with the correct balance of air and available water, the larger the reservoir there is for the plant to exploit. Where there is no mechanical impediment like massive clay, iron pan or a high water-table, nearly all arable crops have roots which will develop below a depth of 3 ft and some as far down as 7 ft.



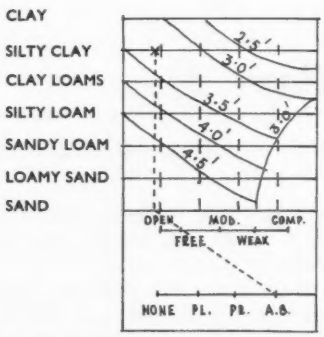
Rooting depths in deep aerated soils

Water available to plants to varying depth

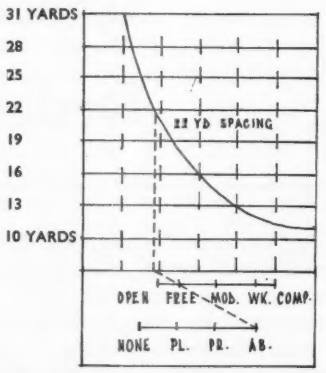
Evapo-transpiration of June and July	Loamy sands	Sandy loams	Silty loam	Well-structured clay	Depth
in.	*in.*	*in.*	*in.*	*in.*	*ft*
					0·5
	1	2	2½	1½	1·5
6–8	2	4	5	3	2·5
	3	6	7½	4½	3·5
	4	8	9	6	4·5

From this it will be seen that in some soils deep-rooting crops will be able to withstand a sustained drought where the underdrainage is deep.

It follows that if air can be introduced into the soil by drainage, then the deeper the underdrainage the more soil there will be for the plant to exploit and the greater the yield. The depth of underdrainage is, therefore, fixed first and the laterals spaced so that there would be a rise of approximately 12 in. midway between them. The depth has been related to soil type by examining the deepest successful schemes, and the spacing by successful schemes and failures.



Depth of underdrainage and soil characteristic chart. The example for a moderate free angular blocky silty clay is 3·3 ft



Spacing of laterals—soil characteristic chart for clay. The example for a moderate free angular blocky clay is 22 yd

Very often the cost of such schemes is too high and the advantages of the various permeability aids have to be explored. In massive clay, for example, with permeable fill and subsoiling the spacing can be increased by 100 per cent, but in well-structured soils the spacing might be increased by only 30 per cent. If a system with subsoiling is too expensive mole drainage might be tried. With massive clays a spacing between mains of 2 chains would be successful, and with strong-structured clay in which cracks are well developed, 4 or more chains, provided the gradient is not excessive.

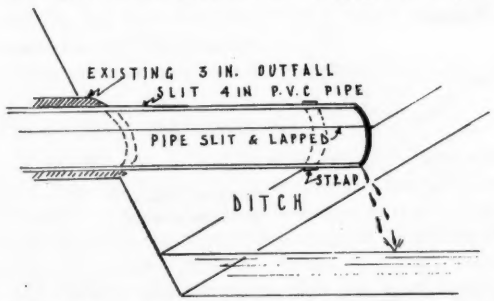
It is essential that moling and subsoiling are done under the right conditions. Moling when the top layer of soil is moist and the horizon in which the mole is to be drawn is also moist, whilst subsoiling is most effective when the soil is all dry. To achieve best results, therefore, a farmer must be prepared to subsoil or mole according to the condition of the ground and when it suits his farming practice. Very often the most advantageous and effective method of draining heavy land is to mole as soon as soil conditions permit after the mains have been laid, and restore the artificial structure to the land by subsequent moling or subsoiling every three or five years.

The efficiency of an underdrainage system does not only depend upon the right spacing, depth and permeability aid, but also upon the care with which the work is carried out. To be most effective underdrainage should be done when the soil is dry. This ensures that:

1. The soil structure is not damaged and the cutting of the trench has a shattering effect resulting in the maximum permeability being preserved and induced.
2. The sides of the trench are not smeared, which impedes the inflow of water into the trench and tile.
3. The backfill is returned in a reasonably permeable state.
4. The butt joints and slits are not sealed with soil in a pasty condition.

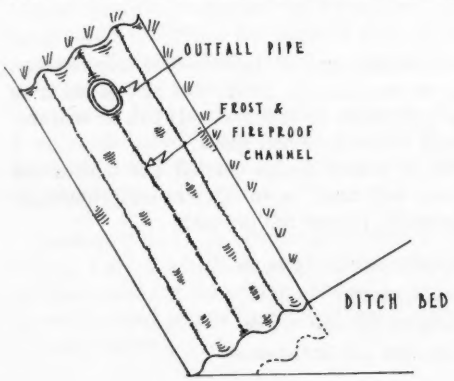
Even though a system is installed during ideal conditions, its effectiveness can be adversely affected by an inadequate outfall. In many soils it is essential that the outfalls should always be clear of the water so that the soil structure does not collapse and the permeability of the soil thereby reduced. This is particularly important in sandy and organic soils and where mole drains have been drawn. A good outfall is dependent upon a good ditch, but the ease with which a ditch can be maintained is dependent upon the outfall design. Increasingly, farmers are turning to machines to replace hand labour and the rodding the ditches is no exception, but the old-fashioned permanent outfall which protrudes into the ditch is an impediment to the mechanical scythe or flayer. Fortunately, removable pipes can now be fitted so that when the batter is to be scythed the protruding pipe can be removed and the batter cut efficiently without fear of damage to the headwall or machinery. After maintenance the pipe is put back so that it discharges directly over the ditch bed. In addition to the ease with which maintenance can be carried out, erosion of the batter is eliminated and the danger of pests entering is reduced.

The Ministry of Agriculture, Fisheries and Food have designed standard retractable outfalls, but where outfalls exist these can be cut back and a removable end fitted. This is simply done by taking a 2-ft length of thin



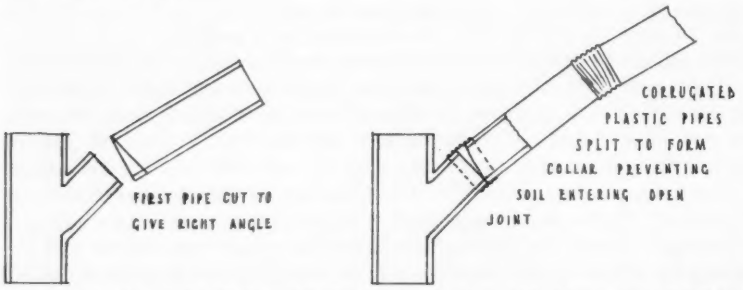
A removable outfall

P.V.C. pipe of larger diameter and cutting a strip out along the top. The cut pipe is compressed and slid into the existing outfall and allowed to spring



Corrugated P.V.C. sheet protecting drain batter

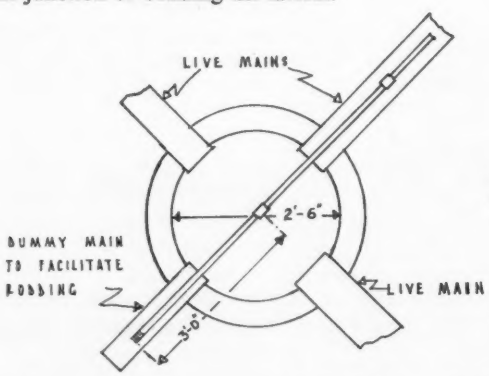
back to fit tightly. For example, cut a half inch strip out of a 4-in. P.V.C. fall pipe, compress and slide into an existing 3-in. diameter pipe which has been cut back to the batter.



Two methods of marrying the lateral to the junction to prevent blocking-up by soil falling in

In deep, flat, battered drains it may not be practicable to fit a very long removable outfall and some internal drainage boards are insisting on the outfall finishing flush with the batter and a channel in frost-resisting material being provided down to the bed.

Often the failure of the outfall junctions are the most frequent cause of failure of underdrainage systems. Where a lateral joins a main, a purpose-made joint is made between the junction and the lateral, but it is often essential to alter the angle. This may be done in two ways, either by cutting the junction or bending the lateral.



Manhole layout to facilitate rodding

Where mains meet, a manhole is often required, especially if unavoidable silting is likely to take place. To ensure that the mains can be rodded it is preferable to have pipes opposite each other so that the rods can be worked backwards and forwards vigorously in the confined space.

But you have not finished yet! A sound design carried out with good workmanship, under dry conditions, will result in an efficient underdrainage system only if it is maintained properly. Forget the proverb:

'OUT OF SIGHT OUT OF MIND'

and remember

If from investments you wish to gain,
first drain your land and then maintain.

Growing Potatoes for Crisping

G. P. F. Little J. W. Hibler

CHESHIRE is traditionally an area where potatoes have been marketed off the field, with most farms growing a sequence of first earlies, second earlies and main crops. Over the last few years two of the main potato crisping firms have created a considerable interest in growing potatoes under contract. The appeal to growers is a reduction in the fluctuation in financial returns from the potato crop.

This increasing interest, and the lack of experience in north Cheshire with ware potato storage, prompted the Macclesfield area district advisers to seek the co-operation of their regional crop husbandry colleagues and the technical advisers of the crisping firms working in the area, in organizing a farmer's meeting. This was held at the Cottons Hotel, Knutsford on 28th November, 1968.

An expression of the considerable interest in growing potatoes for crisping was the fact that more than 125 growers from all over Cheshire and parts of south Lancashire attended.

The main points from the papers given to the meeting were:

Processors' requirements

Quantity. Mr. J. B. Williams, Technical Manager for Golden Wonder Ltd., said that the potato consumption per head of the population in Britain has hovered around a level of 200 lb per year over the past twenty years. In 1967 only about 10 per cent of this amount was being processed in the form of not only crisps, but also frozen potatoes, instant mash potatoes, etc.

In 1959 it was estimated that the crisp market was worth less than £9 million, but by 1967 it had increased to more than £57 million and it is estimated to be growing at approximately 10–15 per cent per year. In the United States it is reputed that the annual consumption is 5½ lb of crisps per head, while in Britain the figure is only 2½ lb per head. So, if the American pattern is followed here, there is a tremendous potential demand for crisping potatoes in this country.

Between 1955 and 1967 the amount of potatoes used for crisping in Britain increased from 50,000 to 360,000 tons and by 1975 the Potato Marketing Board estimate that the requirement will be 600,000 tons for crisping alone.

Quality. Mr. D. A. Fleming of Smiths Food Group Ltd., discussed the variety Record which accounts for more than 85 per cent of the tonnage of potatoes used for the crisping industry. Its low 'reducing sugar' content, high dry matter and yellow flesh are all characteristics which make it a very useful crisping variety.

One of the most common faults found in crisps, that of 'greening', is caused by insufficient earthing-up during field cultivations. Wider rows than the present Cheshire practice of 28 in. (or even 26 in.) would help to overcome this trouble by giving more soil for covering up the developing tubers.

Dark brown crisps are caused by a high 'reducing sugar' content in the tuber. This is brought about by keeping the crop after lifting at below a temperature of 48°F. Handling at temperatures below this also renders a potato susceptible to bruising. Lifting immature tubers also leads to bruising and, therefore, dull coloured areas in the resultant crisps. Haulms should be burned off when they are turning yellow. The aim should be to lift in October some three weeks after burning off, as the weather then is usually still warm enough to avoid an increase in the 'reducing sugar' content of the crop.

Growing the crop

Mr. K. R. Hubbard, Crop Husbandry Adviser, National Agricultural Advisory Service, indicated that the aim, as in all forms of potato growing, should be the highest possible yield of saleable ware.

Seed of at least up to 'A' standard should be used, as 'once grown' seed can cause considerable yield loss in bad virus years. Seed should be examined for tuber diseases as soon as delivered and subsequently several times during the winter. Gangrene and skin spot, which usually do not become noticeable until after January, are particularly important as they can cause blanks in the crop and so reduce yields.

Seed rates of about 20 cwt per acre appear from our present information to give the best results. To date few, if any, experiments have been carried out on spacing and row width for the variety Record. Information from trials on Majestic and King Edward, however, indicates that there is no yield reduction with row widths up to 36 in. It, therefore, seems advisable to go up to 30 or 32 in. to prevent 'greening' and to give more room for wheels, rather than to continue using Cheshire traditional 26—28 in. rows.

Two factors that are likely to limit potato yields in north Cheshire are potato cyst eelworm and magnesium deficiency. The only way to prevent trouble from eelworm is to lengthen the rotation to no more than one potato crop in five years. Soils in north Cheshire tend to be low in magnesium, leading to early 'die back' of the haulm and, therefore, reduced yields. An application of up to 5 cwt per acre of Kieserite can reduce this trouble on low magnesium soils.

Record is fairly resistant to foliage and tuber blight, but in Cheshire it is not normally worth while spraying before the third week in July.

Harvesting and storage

The afternoon session was devoted to a discussion of harvesting and storage. At harvesting, a cushion of soil is useful in reducing damage. Bruised potatoes are not only bad for crisp quality but also provide an entry for diseases in store. Potatoes from wet patches in fields and loads that have been rained on should not be stored, but processed as soon as possible. Soil in stores blocks air currents, can lead to heating and collapse, and must be avoided.

For satisfactory storage of potatoes for crisping, the store walls must be well insulated. This can be done with a double row of bales built so that all the gaps are covered. Polythene can be used in the cavity between the bales

or next to the wall, but never next to the potatoes. This is essential so that the stored crop can be maintained at 48°F, below which 'sugaring' occurs.

Two feet of loose straw on netting should be put on top of the potatoes for frost protection, prevention of 'greening' and to act as a sponge to absorb moisture from the potatoes.

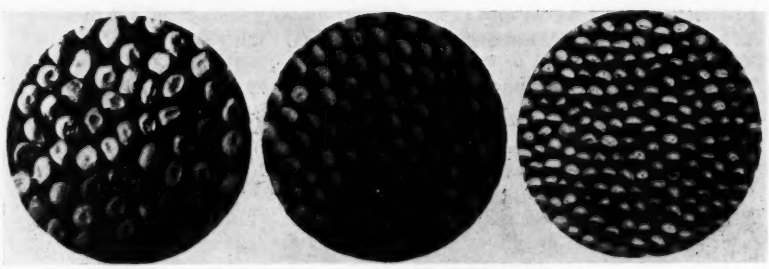
Sprout inhibitors are necessary if potatoes are to be kept after Christmas.

The future

The lack of information on row width and spacing for Record potatoes has prompted the N.A.A.S. to put down three trials in north Cheshire and Shropshire in 1969. It is clear that further meetings and demonstrations will be required in future years to keep farmers in the area informed about new developments in the field of growing potatoes for crisping.

This article has been contributed by **G. P. F. Little, B.Sc. (Agric.)** and **J. W. Hibler, B.Sc.**, who are District Agricultural Advisers for the N.A.A.S. in Cheshire.

Can British growers double their production of dried peas?

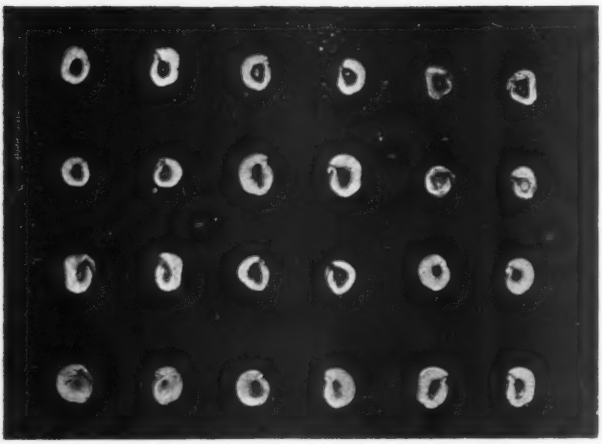


Dik Tom *Rondo* *Maro*

Dried Peas

G. P. Gent

DRIED peas have always been considered a very useful crop for growing in East Anglia, but developments during the last few years should allow the crop to be grown profitably in many areas of the Midlands and South-east England. This is particularly important for farmers in these areas as the need for a profitable and easily integrated break crop is greater now than at any time in the past.



Marsh spot affected peas

Dried peas have many advantages as break crops. They should be profitable (see Table which gives a typical gross margin costing), they can be sown and harvested with cereal growing machinery, they are not affected by cereal diseases, they enrich the soil with nitrogen from their root nodules, and many weeds that are difficult to control in cereals can be controlled in peas with selective herbicides. The crop is usually harvested during early August, so allowing post harvest cultivations for the control of couch grass and timely sowing of winter wheat and it should find a ready market in this country as large quantities of peas are now being imported each year.

Table

Gross margin costing for dried peas

	£	£
Output		
1·3 tons at £40 per ton		52·0
Variable costs		
Seed	10·5	
Fertilizer	1·8	
Other materials	3·8	
Casual labour	—	
Contract services	—	16·1
Gross margin		35·9

Dried peas have two primary uses. They can be sold in packets when dry for the housewife to soak overnight and cook, or they can be canned as processed peas. Here the peas are soaked and then canned in a similar way to garden peas. Currently, most of the peas sold in packets are home-grown but many of the peas for canning are imported from America. Most of these are of the type called Alaskas and they have many advantages to the canners. Alaskas can be bought in large quantities at a low moisture content with a guarantee that the peas will be even in colour and free from defects. When canned, Alaska peas absorb artificial colouring uniformly and are much smaller than most home-produced peas.

However, after devaluation, Alaska peas are often more expensive than home-produced crops and many canners would welcome the competitive

production of similar British peas. With the vagaries of our climate it is unlikely that canners would consider home-produced peas for their total requirements, but to aim for 50 per cent of the tonnage of Alaska type peas for processing would allow up to an extra 30,000 acres of peas to be grown annually.

Alaska peas do not give economic yields when grown in this country, but the variety Vedette gives a canned product of virtually indistinguishable appearance. Vedette has recently been fully tested in the Pea Growing Research Organization (P.G.R.O.) variety trials and has given satisfactory yields linked with other very desirable agricultural characteristics. It matures about mid-July, which is 7-14 days earlier than most other varieties, and the haulm is less dense and consequently easier and cheaper to dry than traditional varieties. This early maturity is particularly useful when integrating peas and cereals, as in most cases it will allow a fortnight to three weeks in which the peas can be harvested before the cereal harvest commences. The ease of drying should also help the spread of dried peas into districts other than East Anglia.

As East Anglia generally is the driest region of the British Isles, and as the success of the dried pea crop depends largely upon good weather at harvest, it seems logical that it should be concentrated in this region. However, the annual rainfall in East Anglia is equally divided over the twelve months, giving approximately 2 in. per month. Many places further south and west, although having a higher annual rainfall, still only average 2 in. or less per month during the critical summer months of July and August. These areas are shown unshaded in the diagram below, which has been extracted from the Climatological Atlas of the British Isles; this can be used as a guide to areas where the crop can be grown with good chances of success. If then, by good marketing, British peas can compete with the imported ones both for price and quality, the growing of an additional 30,000 acres should be possible in he 1970s.

Areas averaging 2 in. of rainfall or less per month during the months of July and August are shown unshaded

Most of the peas sold in packets are of the 'marrowfat' type. These have large squarish seeds as opposed to the round ones of Vedette and Alaska and substantial improvements have been made in the production of these peas. A few years ago the most popular variety was Big Ben but this has now been replaced by Maro. In P.G.R.O. trials Maro gave a 13 per cent higher yield and is much more resistant to the common fungal disease, downy mildew. The main disadvantage of Maro is that it matures 3-7 days later than Big Ben and so increases the possibility of a clash between the pea and cereal harvest. This can be minimized by sowing Maro as early as possible and, in addition to ensuring the earliest ripening, this also gives the highest yields. Under most circumstances Maro should be ready to harvest in late July—early August.

Another new marrowfat pea, Greengolt, has recently completed trial and its main characteristic is that the seed is a much deeper green. This makes it particularly suitable for selling as packet peas where the housewife assesses quality by the intensity and uniformity of colour. Greengolt should be commercially available in 1970.

Another group of pea varieties, namely large blues, are particularly suitable for growing on very fertile soils. These also have round seeds but are larger than Alaska or Vedette. Good varieties from this group are Pauli, Rondo and Dik Trom, and under fertile conditions where marrowfats produce excessively long haulms, these varieties are much more compact and so are easier to harvest. Conversely, on infertile soils, their growth may be so dwarf that they are difficult, if not impossible, to cut efficiently.

During growth, the main problem with pea growing is to protect the crop from wood pigeons and game birds. Bird scarers can be employed for this but probably the most effective measure is to provide a man with cartridges to shoot the wood pigeons at dawn and dusk. The husbandry during this period is well established. Fertilizer is only needed on soils relatively low in potash or phosphate; broad-leaved weeds can be controlled by pre-emergence application of prometryne or post-emergence dinoseb, and wild oats by pre-sowing tri-allate or propham or post-emergence barban. Aphids are occasionally numerous enough to justify control measures and the emergence of pea moth and pea midge are publicized to facilitate their control. One very important disorder of peas to watch for during June and July is manganese deficiency. This can be recognized by inter-veinal yellowing of the leaves and can be caused by unavailability, or deficiency of soil manganese. If no corrective treatments are applied, this leads to the formation of a brown spot in the centre of the pea, commonly called 'marsh spot', which makes the sample unsuitable for human consumption or for use as seed. Symptoms of manganese deficiency must be corrected as soon as they appear by applying 10 lb per acre of manganese sulphate, then further applications of 10 lb per acre at full flower and again seven days later.

The most difficult period during the production of dried peas is at harvest. The safest way to ensure a good sample is to place the peas on four poles for drying but this requires much hand labour and is not practicable for many farmers. The labour requirement at harvest can be reduced by leaving the crop in windrows but this can lead to excessive staining and shelling-out in wet seasons. Under most circumstances a better method is to use a pre-harvest desiccant. Currently there are two materials available, crude sulphuric acid (brown oil of vitriol (B.O.V.)) and diquat. Diquat is usually the more

reliable material, for although its desiccating action is slower than acid, the application time is less critical and the peas are not so severely bleached. Diquat should be applied just after the normal cutting stage when the pods have parchment-like texture and the leaves are dying, while the acid should be applied a few days after this stage.

Peas should be combined as soon as possible (even if this necessitates artificial drying) to reduce the time they are exposed to possible adverse weather. Ideally, they should be dried slowly to allow the moisture to move from the centre of the grain and systems using cool air are often most suitable; hot air systems can be used if temperatures are below 110°F.

In many cases when hot air is used two passes through the drier at 48-hour intervals are necessary to fully remove the moisture from the centre of the seeds.

Dried peas are, and probably always will be, a more difficult crop to grow than cereals but the rewards from the profitability of the crop and its beneficial effect on subsequent cropping, should more than compensate for this.

This article has been contributed by **G. P. Gent,** a Technical Officer at The Research Station of the Pea Growing Research Organisation Limited, Thornhaugh, Peterborough.

Is ploughing essential for growing wheat?

J. E. Whybrew, Deputy Director of Drayton Experimental Husbandry Farm, Stratford-on-Avon, discusses an experiment on

Wheat without Ploughing

THE atrocious autumn weather last year high-lighted many of the problems which beset the arable farmer. Harvest was late and difficult because of the wet weather, and this meant that autumn cultivations were also delayed. The continuous rain also reduced the number of available work-days at a time of the year when they were already limited. So much so, that in many cases, fields intended for autumn wheat were either drilled late in poor seedbeds, or

were not drilled at all. This is a serious situation for the cereal grower, especially on the heavier soils, since he relies to a large extent on the higher production of autumn-sown crops, as compared with spring-sown corn yields, to provide him with his livelihood.

Some farmers, deciding that desperate situations needed desperate remedies, went so far as to eliminate traditional seedbed preparation methods. They were prevented from ploughing by adverse weather conditions so they used cultivators or discs to prepare a seedbed and then either drilled into the rough cultivated soil or, in extreme cases, broadcast the seed on the surface and just harrowed it in. This solution is not new, but it has revived interest in what can be called non-traditional cultivation methods.

In the past, ploughing has always been considered necessary, from several points of view, as the only starting point for working down a seedbed. The main reason has been to provide a weed-free site in which to sow the seed. Previously it has not been possible to control weeds satisfactorily except by cultivation, and obviously the easiest way is to turn a layer of soil upside down and then proceed from this point. New chemicals have been developed over the last few years which have made this function of ploughing less essential. The early work on chemical tillage was carried out using dalapon and this was successful in so far that weeds were controlled satisfactorily without ploughing, but the residual effects of the herbicide damaged the following crop. This damage was reduced to some extent by allowing a period of time to elapse before sowing, but obviously in the case of autumn-sown crops such a delay cannot be tolerated because of the short period of time that is available for autumn drilling; it is only since the introduction of the bipyridyl herbicides, such as paraquat, that it has been possible to spray weeds with the certainty of a rapid kill and of leaving a seedbed free from any residual herbicide activity, at the same time.

If the weed control function of ploughing can now be successfully undertaken by chemicals, are there any other of its functions that can be achieved by cheaper or quicker operations?

First of all, it is necessary to define what are the other functions of ploughing. These would appear to be the amelioration of soil structure by breaking away from the main mass a layer of soil from six to nine inches in depth; aeration of the soil; assistance with drainage by creating fissures through which surplus water can drain away; the turning in of farmyard manure, and the breaking of grassland in readiness for arable operations. A further point which may be important from the aspect of crop hygiene is that ploughing puts crop residues underground where breakdown can take place and so reduce the risk of recurring disease.

These are apparently good arguments for retaining the plough, but if looked at objectively it becomes clear that, with the exception of the burial of crop residues or farmyard manure, all the other functions can be taken over by other methods.

The economic value of FYM. for cereals is small when the costs of handling and spreading are set against the extra yield, and it is probably better used for high value crops such as potatoes.

One important point which must not be forgotten is that ploughing is only the first of a series of preparations that must be carried out before a seedbed is produced. Further cultivations must follow, the number depending on a wide range of factors—soil type and weather conditions being among the

most important. The furrow slice produced by the plough must be broken down to smaller aggregates before seed can be sown successfully.

The total number of operations required to produce a seedbed can be as few as two or three or can rise as high as five or six. An examination of the cropping record book at Drayton E.H.F. for a number of years shows that seedbed preparation for winter wheat, carried out on traditional lines, entails on average at least four cultivations in addition to ploughing.

If this number of operations cannot be reduced then the prospect of being able to drill only a limited acreage under optimum conditions in the autumn still remains; but if they can be reduced, then a larger acreage can be sown under optimum conditions at a time when the risk of worsening weather and soil conditions increases daily. For this reason the discovery of the bipyridyl herbicides is important because it releases the farmer from the timetable imposed by ploughing.

A great deal of success has been achieved in the development of 'direct drilling' systems of corn growing, and the conditions under which this method can be successfully employed have been outlined by the research workers of I.C.I. Briefly, soil types must be selected carefully and should be free draining, light or medium soils only, relatively free from stones and free from couch if possible. These restrictions imply that the heavier clay soils are not likely to benefit from the direct drilling technique. Experimental work on the E.H.F.s and elsewhere has shown that as soils become heavier the problems increase. The need for soil disturbance becomes important because the surface drainage situation is worsened by direct drilling under adverse weather conditions.

If a coulter is drawn through a wet undisturbed clay soil it leaves behind a smeared furrow through which water finds no easy passage and in which the seed is not covered. Under such conditions germination of seed corn could be impaired and, in addition, the damp environment of the open slit provides an easy passage for slugs to get at the grain.

However, the situation is not so gloomy as appears at first sight. Paraquat still works equally well on clay soils and this means that ploughing for weed control is not necessary. Ploughing clay soils is a slow, laborious process but it is possible to use other implements for breaking up the soil.

Tined cultivators, chisel ploughs, disc harrows and possibly rotary cultivators, are all capable of carrying out the limited soil disturbance which seems to be essential for the heavier soils. What is more, they are capable of covering a bigger acreage in a given time compared with the plough. A further point in their favour is that the soil is not inverted. Anyone familiar with clay soils will have often seen the situation where the top inch or two of soil is in excellent physical state but where the soil lower down is still wet, raw, and unweathered. It seems rash, particularly in wet conditions, to transpose the two layers, especially when it is clear that when the raw layer is brought to the surface it will need a long period of weathering before it breaks down to a reasonable tilth.

The depth to which the soil needs to be worked for cereals is not very great; four inches or so seems to be sufficient, although the precise depth will be dictated more by soil conditions than anything else. This will provide sufficient depth of loose soil in which normal coulter drills can work satisfactorily, so that there is no need for specialist equipment. This technique can result in significant savings in tractor and manhour requirements, and brings us

back to the point made earlier that if a reduced cultivations technique is adopted, then a larger acreage can be prepared and drilled successfully in a much shorter period of time in a season when time is at a premium, or the same acreage worked down by fewer men.

Last autumn at Drayton we found ourselves in the same situation as everybody else with a large proportion of arable land due to be sown to winter corn following a wet summer, and in a wet autumn. We knew that to plough would provide us with problems of seedbed preparation which would be difficult to overcome. As a result of some previous experience we were convinced that the concept of limited cultivations for heavy clay soils was a valid one which could provide us with useful dividends. Therefore, we practised what we had previously observed in a limited way on two-thirds of the farm.

Over the last few years we have had, on one of our fields on the farm, a weed problem with sterile brome grass (a most inappropriate name!) sown deliberately with winter wheat continuously. This cropping sequence necessitated the formation of a husbandry technique to control the grass. We knew that if we ploughed and worked down a seedbed in the normal manner the sterile brome seeds would germinate rapidly in September and October at the time when we wanted to drill our winter wheat. This meant that the weed would be competing very successfully with the crop for nutrients, water and light, and would create problems at harvest time as well as reducing yields.

We decided that a delayed drilling technique would offer the best chance of overcoming this problem without having to change the cropping programme of the field. This consisted of burning the straw after harvest, working a shallow tilth with discs or tined cultivators and letting the brome seedlings grow (fortunately it appears to have little or no dormancy) until we thought that the majority of the seeds had germinated. This often led to the field resembling a lawn at the end of October.

No other cultivations were carried out following the initial ones and in any case the weather during the last few autumns has not allowed much chance of interim cultivations. This 'lawn' was then sprayed with paraquat and the corn drilled into the dead and dying grass residues a few days later. Our usual practice is to spray with paraquat at two pints per acre in twenty gallons of water, preferably in dull conditions or in the evening when light intensity is low, since this enhances the effectiveness of the chemical.

This operation has been eminently successful in controlling this particular grassy weed problem, but we half expected that this rather cavalier treatment of lower lias clay might lead to a reduction in yield. It is difficult to be precise on this point since two factors, weed control and cultivation method, are involved, but we did, in fact, get higher yields than previously. How much was due to the elimination of competition from grass weeds is not known, but the yields of this field compared favourably with the average yields of fields that had been ploughed and worked down in the normal manner.

Bearing this experience in mind, when we faced the problems of last autumn with its dreadful weather, we were prepared to cultivate rather than plough. The lower lias is a calcareous clay, which so long as it is weathered is capable of producing a reasonable crumb structure in the top inch or two of soil, even though it may be wet and sticky down below. We felt that in the circumstances of last autumn it would be unwise, to say the least, to turn over this layer and substitute some raw, sticky clay which needed a long period of weathering

before it could be fit for drilling, so we decided to cultivate rather than plough and, indeed, two thirds of the planned autumn acreage was cultivated or disced. The other third was ploughed in the usual way with great difficulty.

On average, the cultivated land required 1·5 man and tractor hours per acre to produce a reasonable seedbed. On the other hand, in fields that were ploughed it took 4·5 hours per acre to prepare a seedbed.

The seedbeds prepared by the two different systems were similar in appearance except for some stubble residues which were visible in fields which had not been ploughed. Winter wheat, oats and beans have all be sown in seedbeds prepared by reduced cultivations and, at the time of writing, there seems little to choose between the crops growing on the two different systems. The acid test will take place at harvest, but as a result of our previous experience we feel reasonably confident that our yields will be similar.

The extra cost of paraquat spraying has been more than covered by eliminating ploughing and, in addition, we have had a bonus in the form of good control of annual grass weeds, such as *poa trivalis*, which flourish in wet autumns when cultivations are difficult or impossible to carry out successfully.

One fact is certain—we would not have been able to sow our scheduled acreage of winter corn if we had not dispensed with ploughing last autumn.

The long-term effects of such a change in cultivation techniques cannot easily be predicted and it is too early to say how long the system will remain effective. Drainage is likely to be a major problem on heavy soils but the cumulative effect of repeated shallow working has not yet become evident. Obviously the need for deep cultivations, such as bursting and mole ploughing in suitable soil conditions and at correct times, will occur and will have to be carried out. Situations will also arise where ploughing is necessary, e.g., where FYM. is ploughed in or where particular weed problems can be more easily be solved by ploughing, and this will be done.

Our future approach to the cultivation problem of clay land will be more flexible, but it will be aimed at reducing man hour requirements consistent with maintaining high yields.

Royal Agricultural Society of England

NATIONAL AGRICULTURAL CENTRE

KENILWORTH, WARWICKSHIRE

Chemicals for the Potato Grower

A conference, organized by the R.A.S.E. and N.F.U., will be held at the Centre on 29th October, 1969.

Agricultural chemicals are used at almost every stage of the cycle of the potato crop and the conference is designed to enable growers to consider in some depth the advantages and limitations in the use of such chemicals. Speakers will cover subjects such as the role of cultivations and herbicides, blight control, and chemicals for storage and sprout control. Ample time will be set aside for discussion.

Programmes and application forms may be obtained from the Deputy Secretary (N.A.C.) National Agricultural Centre, Kenilworth, Warwickshire. (Tel: 0203-56151).

This Report, recently published by the Ministry, sets out to establish what should be regarded as good dairy practice

Farm Dairy Buildings Report

P. G. M. Riding

ALTHOUGH we are constantly reminded to drink a 'pinta' a day (and take an extra one for luck) precious few of us have ever seen a cow being milked and a very small minority indeed have ever had the opportunity of tackling the job themselves. So long as the 'pinta' turns up on the doorstep as regular as clockwork is all the thought that 'Mr. Average' gives to the whole business of milk production. Not so, of course, for the dairy farmer, whose main aim in life is to produce milk under hygienic conditions, at an economic price.

Changes in the framing practices, e.g., the introduction of slatted floors, cubicles, kennels, etc., and the attendant problem of muck disposal rendered a review of the requirements for clean milk production desirable. The Ministry, therefore, set up a working party to consider these problems. Its report, published recently, sets out to establish what should be regarded as good dairy practice, bearing in mind the need to make the best use of capital and labour to achieve clean milk production. There is no doubt that clean milk production depends mainly on proper herd management, the equipment used and on sound methods of production and handling.

New techniques, combined with heavier stocking densities and larger herds, have invariably called for more buildings for the dairy herd. Buildings that are thought out in advance, which allow flexibility and pay regard to the possibility of further expansion at a later date, are normally of good design and thus easily meet statutory structural requirements and encourage the retention of hygienic methods.

The report reviews the operations and practices adopted in all popular systems used for milk production in this country.

Cowhouses

It is often forgotten that four-fifths of the dairy herds in England and Wales are still milked in the traditional cowhouse. When milking is carried out where cows are housed and fed, good management combined with methods which overcome the risk of contamination of the milk from muck must be employed. This accounts for the importance placed on milking equipment being moved to a milk room for cleansing and storage between milkings. Clearly the design of the building can help hygiene, for muck not readily removed from floor, walls and fittings, etc., can lead to contamination and increased costs. Thank heavens there are not so many farms nowadays which

still have to rely on barrow and shovel for muck removal, tractor mounted scrapers and mechanical dung channel cleaning being increasingly employed. The last named have much to commend them, particularly to the farmer faced with a long winter on heavy land in a high rainfall area who favours a 'dry' cowshed, by spreading ground limestone on the floor. This system has the advantage that less washing down water is used, and any dung deposited other than in the channel does not adhere to the floor and is easily removed. When plenty of clean water is available and a liquid muck disposal system is practised satisfactorily then a 'flush' system is another alternative. This requires a self cleansing deep channel beneath a metal gridded dung channel which can be flushed daily into the disposal system. After flushing the channel must be cleaned down with water and the flush gate closed until the system is emptied again. At last we have a practical approach to the old 'bugbear' of trapped gullies within buildings, for it is recognized that experience has shown that they can be acceptable on hygienic grounds so long as they are efficiently designed as to be easily cleaned, are readily accessible and are kept clean. They will, however, have to remain with us until Regulation 13 of the Milk and Dairies (General) Regulations 1959, can be amended.

Milking parlours

The report gives general advice on the siting of parlours and draws attention to the need for a holding pen and crush for regular inspection and any veterinary treatment.

Dirty milking equipment is still the greatest source of milk contamination so it is natural that the report stresses the importance of it being properly cleansed and that particular attention should be paid to avoiding risers and adverse slopes in milk lines, because under vacuum they may impair milking efficiency.

The general conditions which should be met when installing milking machine plants if they are to work efficiently are set out in a new booklet issued by the British Standards Institute. (Milking Installations: C.P. 3007: 1968).

With the emergence of larger herds it is recognized that relay milking may have to be practised when herdsmen in turn bring the herd to the parlour and use common facilities. There is no objection to this but it is advisable to cleanse the equipment after a 4–5 hours run.

While efficient internal trapped gullies which are kept clean and clear are acceptable in a parlour, a sump and pump system is thought to be generally undesirable and to be resorted to only where no other economic method is possible.

Milking bails and prefabricated parlours

The development of the milking bail from its inception as a free standing parlour without floor, which could be moved daily round a field, is reviewed in the report as are the potential users. Users range from those farming scattered or extensive acreage who take a bail round the fields in summer perhaps to a rotating grass break, to those who want an 'instant' parlour at low cost. No objection is seen to the use of bails and prefabricated parlours on fixed sites but they must satisfy the same conditions as conventional parlours and milk rooms. This advice should do much to overcome any uncertainty which has arisen about siting a bail in close proximity to a home-

stead. Any idea of placing a bail, say, in an open strawyard obviously cannot be tolerated.

Integrated dairy buildings

As one might expect, the report looks carefully at integrated buildings in which cows are housed, fed and milked under one roof. In such a layout, silage may be made and stored with other bulk foods, while milk may also be handled, bottled and stored. In recent years the tendency brought about by economic considerations has led to doubt as to the extent to which there should, on hygiene grounds, be physical separation between the milking area and the lying area. The report states clearly that there should be physical separation. This means that if the milking parlour has no doors to separate it from the collecting area then the whole area must be regarded as the milking area and managed accordingly. It follows, therefore, that if the parlour is not provided with a door but is open to the collecting area, these together constitute a milking area which must be totally enclosed. Such a milking area may have a solid floor throughout although there is no objection to a gridded floor in the parlour or in front of the parlour entrance. For the purpose of the report, grids, as distinct from slats, have only a shallow pit beneath them and are not intended for the storage of slurry. The gridded area must be washed down and all muck removed from the floor beneath the grids after each milking. The drainage may be led to a slatted area outside the milking area or to a properly trapped drain also outside the milking area. There is no objection to a slatted area in a collecting yard, provided there is a door at the entrance to the parlour which is kept closed between milkings. However, in the interest of hygiene, the slatted area should not extend right up to the parlour entrance but should stop a short distance from it, to provide a gridded forecourt. A channel under grids in a parlour can be connected to a slurry pit under slats outside the parlour, but there must be no air-to-air connection. Connection should be via a suitable disconnecting trap, while slurry in the pit must be removed before it reaches the level of the connecting pipe.

The report comes to the conclusion that there is no evidence to show that muck lying in a pit below slatted floors is any more likely to contaminate the milk in the milking area than manure in a strawyard. It is, therefore, contended that a controlled manure pit for dairy cows only can be acceptable within integrated buildings. It is essential that such manure pits do not become cesspools by taking anything other than wastes from the dairy herd so that drains from other stock buildings, silage or dairy washings do not find their way into them.

Lighting and ventilation

Although natural light is a desirable feature in any working building, it is not essential for carrying out milking and cleaning but both cowshed and parlour must have sufficient natural or artificial light for the operator to work efficiently. In integrated buildings ventilation can be a problem, and to ensure that contaminated air from the collecting, loafing or lying area, does not enter the parlour or milk room, mechanical ventilation is essential in order that air flows the other way from the milk room to the parlour and collecting yard, whether or not the parlour has an external wall. In effect this means that in integrated buildings a pressurized system to give not less than 0·2 in swg is required to give adequate ventilation.

Cow cubicles and kennels

All the well-known advantages which accrue from this system of housing dairy cows, including cleanliness of cows, freedom from injury, economy in the use of litter for bedding down and reduction in labour, are acknowledged. Against this there is, of course, the disadvantage of having to cope with slurry which can be dealt with mechanically if thought is given at the planning stage to the way this can best be done. Optimum economic building size for cubicle housing, types of cubicle or kennel stall divisions, widths of passageways and heights of heelstones and other matters are all examined, while dimensions which are critical are identified.

Building layouts

Perhaps one of the most helpful features of the report is a series of representative layouts which illustrate the principles defined. They clarify those parts of the text which cover the relationship of the milking area to the housing area in an integrated building.

Manure removal

As the disposal of farm wastes is one of the major problems facing dairy farmers it is not surprising that the report includes an appendix on the subject. It briefly reviews the physical, chemical and biological properties of such wastes and offers good advice on the management of storage tanks below slatted floors. Anaerobic action produces odours and poisonous gases so care should be taken to prevent wastes from going septic. This can be achieved by emptying tanks at frequent intervals if this is possible. Where this cannot be done slurry should not be disturbed, agitated, or emptied until animals have been removed from the building, and good ventilation must be assured. There should however be no need to remind anybody connected with planning a new dairy unit that regard must be paid at an early stage to the manure disposal system to be adopted, as this, like the feeding system, will have a profound effect on the layout.

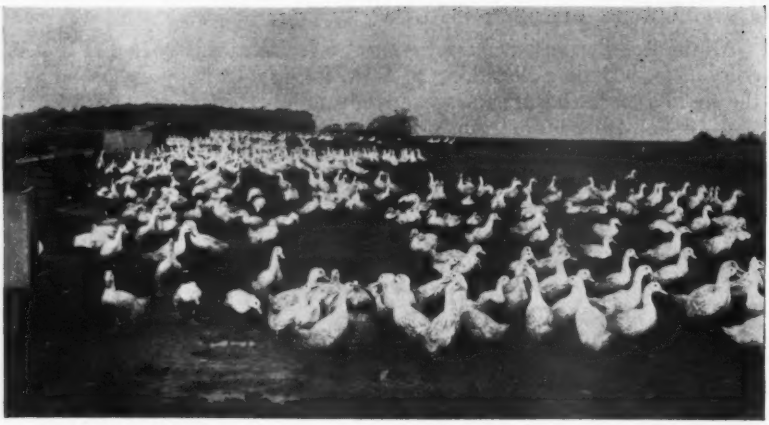
It is appropriate that final disposal of farm dairy wastes in lagoons should have been examined, for the conclusion reached is that in Britain the climate is generally too wet and cold for adequate digestion.

Planning ahead

To conclude, the report is commended to the close attention of both dairy farmers and their advisers, particularly those who may be considering new layouts or improvements to their buildings. To follow the advice given will certainly enable them to benefit by the wealth of experience which has accumulated over the years in the efforts made to ensure the production of clean milk and its doorstep delivery at the right price.

Further advice is, of course, available from the Ministry through the A.L.S. and Dairy Husbandry Advisers. Application should be made to the Divisional Land Commissioner at the nearest Divisional Office of the Ministry.

This article has been contributed by **Peter Riding, F.L.A.S.,** Regional Land Commissioner at A.L.S. Headquarters, who was a member of the Working Party on Farm Dairy Buildings.



Summer fattening 4-8 weeks of age

Norfolk Ducks

Jenny Cullington

ALTHOUGH well over 2,000,000 ducks are sold annually, probably less is generally known about the industry that produces them than any other branch of present-day poultry farming.

There are two reasons why so little is known. Firstly, the men who are engaged in this work are few in number, with not more than a dozen or so operating in a big way of business; secondly and understandably, they are not at all anxious to divulge any of their methods or ideas. This aura of apparent mystery that surrounds them is of many years standing and goes back to the beginning of the century, when production started on the sandy soils of the Breckland in south Norfolk.

When turkey farmers were counting their birds in hundreds these duck fatteners were doing so in thousands, and the June, 1939, census of 'Ducks 350,000, Turkeys 80,000' will serve to illustrate this fact. Until a few years ago Norfolk produced almost all the ducks eaten in Britain but production in Lincolnshire is now keeping pace with this county's output.

We talk very earnestly these days of integration but it was the duck fattener who was the first to inculcate this into the poultry field and in a big way at that. Apart from a few instances of buying-in the day-old, he has always carried out the whole operation, hatching, brooding, rearing, fattening, plucking and latterly processing, boxing, freezing and marketing. Integration is nothing new to him and he was enjoying its financial benefits long before the introduction of the broiler.

Production methods

The methods of production have not really changed to any extent over the years, and the same basic principles still apply, although naturally they have become more sophisticated. Cabinet incubators have replaced the hot water and flat hot air types, solid floors have given way to those of wire, paraffin oil to electricity and gas, and wet mash feeding to the use of pellets, with general improvement in nutritional standards.

Disease control

Disease during brooding, particularly in the last few years, has caused heavy losses, and much work has gone into an effort to overcome a most trying and difficult situation. The importance that segregation and hygiene play in its control is fully realized. Separating the different age groups and allowing as little human contact between them as possible has helped considerably and has also pinpointed the importance of sound management at what is the most critical time of the duck's life.

Rearing and fattening problems

There has been a recent awareness of the far from ideal conditions under which the ducks are reared from 4 to 8 weeks of age and the resultant difficulties experienced by those looking after them during this period. Indeed, the pattern of these conditions has changed very little during the past seventy years when, as now, fattening was conducted in the open air. The ducklings are still taken out of their brooding accommodation and given an open air life in winter and summer alike.

These methods were no doubt acceptable when there was little competition from other table poultry, when labour was cheap and very readily available, and when such things as production costs and margins were not too seriously considered. But the poultry industry in its other spheres has been the most progressive of all in British agriculture, and competition has seriously entered the field. Duck producers could well ask themselves whether their fattening methods are fitting for the present-day economic climate. If they are prepared to face the facts, they will hesitate and reflect awhile.

The moving and erecting of fencing every week, the thawing of water containers, the time spent in walking and the cost of mechanical transport for watering and feeding are all expensive operations. These jobs can also be exceedingly unpleasant in mud, frost and snow and it is doubtful whether, in the future, men will be prepared to do such work. We are already seeing on the more progressive units the establishment of houses that will accommodate the ducks during the winter. Man and duck can then enjoy dry and pleasant conditions and the latter will not be compelled to share its food with wild birds. These are a constant menace when the hoppers are outside and the question of the carrying and transmission of disease by them is always a hazard of a magnitude which is impossible to assess.

Duck nutrition until a few years ago was very much a hit-and-miss affair, and rations designed for chickens were considered satisfactory. We now know that this is not so and diets are specifically formulated for stock of different ages. The amount of general research done in this country is negligible, and research in nutrition is very limited. So it is to the Americans we turn and to their Cornell University Research Station at Eastport, Long

Winter rearing—
4 weeks of age

Island. For some years they have devoted work to the feeding of this type of bird and we are guided by their recommendations for maximum growth and efficiency. In the light of their present knowledge they make the following recommendations.

Nutrient	Starter 0–2 weeks	Grower 2 wks to market
Protein %[1]	22	18
Metabolizable energy (KCa/lb)	1,300+	1,350+
ME/P ratio[2]	60–62	77–80
Calcium %	1·0	1·0
Phosphorous total %	0·7	0·7
Phosphorous available %	0·5	0·5
Vitamin A U.S.P. units/1 lb	4,000	3,000
Vitamin D_3 IU/lb	500	500
Vitamin E IU/lb[3]	2·5	2·5
Vitamin K mg/lb[3,4]	1	1
Riboglavin mg/lb	2	2
Vitamin B_{12} mg/lb	5	5
Niacin mg/lb	30	25
Pantotheric acid mg/lb	6	6
Manganese mg/lb[3]	25	25
Zinc mg/lb[3]	15	15

1. Controlled feed at rate of 0·4–0·5 lb/duck/day.
2. $\text{ME/P} = \frac{\text{Kilcalories metabolizable energy per lb}}{\text{Protein}}$
3. Indicates amounts to be added.
4. As menadione sodium bisulfite.

Rations compiled to these standards have consistently given good results when fed at the Cornell Duck Research Laboratory.

The life of a duck destined for the table is short—a mere eight weeks—so there is not a great deal of time available for miscalculation in feeding or the upsetting of efficiency factors.

We in this country have not been too concerned with the fat content of meat, but the Americans certainly have. As would be expected, the duck has come under scrutiny and the connoisseurs amongst us who enjoy eating duck will not have missed the high percentage of fat that drips from the birds during cooking. In carcase composition it is similar to the pig, in that both have a most efficient metabolic system for the synthesis of fat. This question is being tackled by varying the energy/protein relationships.

The Americans are also concerned, amongst other things, with environment, factors of management, disease and its control. Their general approach

is that the breed they are using (the Pekin) is genetically capable of giving improved results if it is submitted to better conditions in the field. This may apply here and we can well consider if our breeds are reaching the potential of which they are capable.

Jenny Cullington, N.D.P., is the Ministry's County Poultry Husbandry Adviser for Norfolk. She was trained at Harper Adams College and has specialized in all aspects of duck production.

Any industry that seems isolated from its fellows, is tightly knit, relatively small and in the hands of a few men, must of necessity be interesting. For many years I have had the privilege of working with the Norfolk producers and I have come to appreciate the difficulties that beset them, together with the resilience that seems to be naturally theirs. I appreciate, too, that at times everything has gone well for them.

In this esoteric industry one comes to the conclusion that successful duck fatteners are born and not made and that there are no exceptions to the rule.

Bulb Onions

J. D. Whitwell, N.D.H., Kirton Experimental Station.

The geographical location of production

Bulb onions are grown in the Eastern Region of the British Isles in well defined geographical areas, the largest concentrations being on the silt soils in the Holland Division of Lincolnshire and adjacent counties and on the peat fens in parts of Norfolk and the Isle of Ely in Cambridgeshire. Almost 90 per cent of the total acreage grown in England and Wales is located in these areas. In 1968 7,236 acres out of a total of 8,396 acres were grown in the Eastern Region.

The acreage fluctuation

Acreages have fluctuated over the years from a maximum of 15,000 in the war years to a figure just below 2,000 in 1959. Since then there has been a steady increase to 5,900 acres in 1967 and then a rapid rise to 8,400 acres in 1968, an increase of 42 per cent in one year.

This rapid rise in acreage is mainly due to arable farmers taking an interest in onion growing as an alternative to cereals in an effort to offset rising fixed costs and decreasing gross margins.

Home production, imports and prices

On average we import approximately 225,000 tons of onions annually, which represents 75 per cent of our total consumption. The chief foreign suppliers are Spain, The Netherlands, Egypt and Poland, and these countries supply the high-quality, well-graded, clean-skinned, firm onions of known performance and keeping quality, and buyers are prepared to pay between £40 and £50 per ton for them.

The home-grown crop can be equally good, provided care is taken throughout all stages of growing and harvesting and that proper facilities are available for artificial drying.

Growing the crop

The growth cycle. The bulb onion is sown early in the year, in late February or early March, and grows very slowly for the first three months of its life, no real progress being seen until June, and during that time the crop must be kept weed-free. Bulbing is stimulated by long days (14–16 hours long) but in the British climate the seedlings are usually too small to accept this stimulus when the long days occur in late May, and it is usually mid- to late-June before any signs of bulbing are seen. This means that it is important to grow the crop without check so that the plants reach the stage in development when they can start bulbing as soon as possible after late May.

In late August, when the days are too short for bulbing to continue, the onions commence foliar die-down. Once 60 per cent of the tops have fallen to the horizontal position the crop should be lifted and left windrowed in the field for a few days and then brought into store for drying immediately. Onions which are late to commence bulbing fail to die down in late August and are stimulated to grow green leaves in the shortening days from early September onwards. This results in thick-necked onions with poor keeping potential.

This pattern of growth means that onions should be grown without any check at all, from seed sowing to the completion of bulb formation. In order to achieve this, the following aspects of production are important.

Soils. Bulb onions are grown on both peat and mineral soils, and generally speaking, the mineral soil types produce a firmer bulb than the peats. The most suitable soils are very fine sandy loams or sandy loams which have a stable surface structure, are resistant to capping, and have a good underdrainage system. Onions do not thrive in acid soils and if the pH is below 6·5 it becomes necessary to apply lime.

The principles of sound rotation are of vital importance to avoid onion eelworm, onion fly and the disease white rot. A one-in-four rotation is the minimum desirable and should be carefully chosen to avoid the alternative hosts of stem and bulb eelworm, which are a serious menace to onion production.

A suitable rotation would be: onions, short-term grass and brassicas, potatoes, cereals—wheat or barley and onions.

Crops such as vining peas, sugar beet and certain brassicas are capable of supporting stem and bulb eelworm, whilst oats, and tulips and daffodils act

as alternative hosts. To complicate the issue, most annual weeds are hosts of the onion-oat strain of stem and bulb eelworm.

Land preparation

Good land preparation is the most important single factor to ensure success in bulb onion production. Onions are deep-rooted, therefore subsoiling to a depth of 18–20 in. is recommended in the early autumn before the land becomes too wet. Ploughing to a depth of 9–12 in. should follow in early November before the autumn frosts.

In spring the base fertilizers are applied to the ploughed land and final preparations for seed sowing are made on the day the seeds are actually sown. Cultivations should be sufficient to give the required tilth with the minimum number of traverses with the tractor. A single cultivation on the ploughed land and then two passes with seed harrows and a leveller may be all that is required. A firm rooting medium is necessary but the soil must not be over consolidated and, to avoid this, tractors should be fitted with cage-wheels.

Manuring

Recent experimental evidence has indicated that the bulb onion responds to fairly high levels of potassium and moderate levels of phosphate and nitrogen. High nitrogen applications may lower plant stand, delay crop maturity, increase the percentage of thick-necked onions and impair keeping quality. Potassium applications do not affect germination or plant stand and tend to increase yield, and date of maturity, lower the percentage of thick-necked onions and improve keeping quality.

A general fertilizer recommendation advised for Rijnsburger-type bulb onions grown at a density of 7–8 per sq. ft would be 90–100 units N, 80–100 units P_2O_5 and 200–250 units K_2O per acre, the latter applied preferably as sulphate of potash.

Varieties

The Rijnsburger-type onion is the most popular at the present time and nearly all onions grown on silt and peat soils are of this type. The main characteristics are a globular-shape, a straw to copper gold colour (dependent on variety), heavy cropping ability, good keeping quality, freedom from bolting and great suitability for British climatic conditions.

There are many selections of Rijnsburger and differences in performance may be noted between one stock and another. A number have given consistently good performances in trials on both silt and peat soils; these include:

Produrijn	VdP	Rijnsburger	Da
Robusta	Bem	Bola	Jon
Primeur	VdH	Early maincrop	El
Rijnsburger	VdB	Maincrop	El
Rijnsburger	Han	Bono	Jon
Wijbo	SeG	Constanta	ZW(A)
Fenman	N and T	Favourite	PdJ
Rijnsburger	SeG	Hybrid 'C'	GeS

Some Rijnsburger stocks are noted for early foliar die-down; these include:

Luctor	RS	Bono	Jon
Primodoro	RS	Bola	Jon
Early Bird	El		

(Bulbs which die down early are not usually the best keepers; some have deeper coloured skins than others, which is particularly true of Wijbo and Fenman.)

Rijnsburger stocks which have kept well during the past three years of trial experience include:

Produrijn	VdP	Wijbo	SeG	Constanta	ZW(A)
Robusta	Bem	Favourite	PdJ	Rijnsburger Hunderup 65	Da
Rijnsburger	Da	Rijnsburger Han.		Early maincrop	El
Vigo	OE	Fenman	N and T	362/65	VdP

Zittau

This type is not grown widely at the present time, partly because of its top-like shape and partly because of its lower yield potential than Rijnsburger. Good stocks of Zittau keep well and have strong skins of attractive copper-red colour. The best of these include:

Giant Zittau	W and S	Zittau Giant	Da
Zittau	VdP	Zittau Giant Special	N and T

Hybrid varieties

Most of these are of American origin and bulb very early, but fail to grow satisfactorily under British climatic conditions. The bulbs may be small and have deep copper-coloured skins and the yield is usually disappointing. The most promising hybrids are later to finish bulbing than the others and include Sandee (As.), Copper Gem (NK) and Elba Globe (Toz.). Past records have shown that all the American hybrids are subject to 'bolting' and most of them fail to keep well after December.

Polish stocks

The variety Wolska, Wolska 35 and Dura are of Polish origin; they have strong retentive skins of copper-gold colour and keep well.

Seed sowing

Onion seed is sown in early March as soon as the land is fit for working. The final crop density is important because this affects the size of the bulbs and the final yield. Optimum densities are obtained at 10 per sq. ft, but this produces the bulk of the onions in the $1\frac{1}{8}$–$2\frac{1}{2}$ in. diameter range. Very low density (below 4 per sq. ft) produce large onions which mature late and have thick necks. For Rijnsburger types 7–8 per sq. ft is considered the optimum. Plant orientation is also important and it is thought better to have onions spaced 2 in. apart in rows 10 in. apart than 1 in. apart in rows 20 in. apart. However, weeds may become a problem in narrow-spaced rows and most growers and farmers use 'between row' spacings which are common to their farm practice, and these vary from 10 in. to 20 in. apart.

Seed rate per acre

To calculate the seed rate per acre the following formula is used:

$$\text{Seed rate per acre in lb} = \frac{272 \times \text{No. of seeds required per sq. ft}}{\text{Number of seeds per oz in 000's} \times (\text{laboratory germination} - \text{field factor})}$$

Example: assuming that 8 seeds per sq. ft are required and that there are 8,100 seeds per oz in the seed sample and the laboratory germination is 90 per cent, the equation would be written as follows:

$$1 \text{ lb acre} = \frac{272 \times 8}{8{\cdot}1 \times (90\text{–}25)} = 4{\cdot}1 \text{ lb/acre}$$

Number of seeds per ft run

This second calculation is necessary so that seed drills may be calibrated to deliver the necessary number of seeds per ft run of row. To do this, it is necessary to work out the number of seeds in the weight per acre calibrated from the first equation and divide this figure by the number of feet of drill length contained in 1 acre at the required row spacing.

Example: assuming that 4·1 lb of seed are required per acre and that the number of seeds per lb = 129,800 and the rows are spaced equidistant at 16 in. apart, then the calculation would be as follows:

$$\frac{4{\cdot}1 \times 129{,}800}{32{,}670^*} = 16 \text{ seeds/1 ft run at 16 in. row spacing}$$

*In the equation above, 32,670 = the number of feet of drill in 1 acre at 16 in. row width.

Weed control

Herbicides are necessary to control weeds, particularly in the early stages of crop growth. Onion seedlings grow slowly and early weed competition may reduce yields severely. Fortunately there are a number of chemicals which are very effective in controlling weeds but cause minimal or no damage to the crop.

Work on the silt soils at Kirton Experimental Horticulture Station has shown the value of propachlor Ramrod and Alicep as long lasting pre-emergence contact and residual herbicides. Propachlor Ramrod at 6 lb of the commercial product per acre or alternatively Alicep at 4 lb per acre applied two to three weeks after drilling but before crop emergence in fairly high volume (70–100 gall/acre) to moist soil gives weed control for 6–8 weeks. Ramrod will not control black bindweed, redshank and knotgrass and Alicep gives poor control of fumitory, scarlet pimpernel and wild oat.

In late May it is necessary to weed down the onion rows by hand to remove the odd weeds which have established themselves and this is followed by a shallow inter-row cultivation to leave the crop weed-free. Once the crop is clean a post-emergence residual herbicide can be applied; the most suitable ones are Ramrod at 6 lb per acre (plus CIPC if polygonum weeds are a problem), Alicep at 4 lb per acre or CIPC alone at 2–3 pt per acre on mineral soils and 4–6 pt per acre on peat soils.

Post-emergence contact herbicides, such as sodium monochloroacetate, desmetryne, prometryne, ioxynil, nitrofen and phenmedipham are not highly favoured because of their tendency to check the growth of the crop even at the two to three true-leaf stage.

The second application of residual herbicides should keep the crop weed-free until harvesting commences although it may be necessary to remove some of the large weeds by hand during early August to avoid their interference with harvesting.

The recommendations given refer to mineral soils classed as very fine sandy loams or sandy loams. Alicep may cause damage on coarse sandy soils.

Recommendations on peat soils are in general agreement with those given above, and work at the Arthur Rickwood E.H.F. in 1968 showed that Ramrod at 6 lb per acre plus 4 pt of 40 per cent CIPC applied pre-emergence followed by Alicep at 4 lb per acre applied at the early one-leaf stage kept the plots clean until the end of May.

Part 2 of this article will appear in the November issue

Tax in perspective

Tax Allowances and Grants for Plant and Machinery

E. S. Carter and G. H. Camamile

THE former investment allowances for tax purposes were withdrawn on 17th January, 1966; for agriculture they were replaced under the Agriculture Act, 1967 by grants on fixed equipment and long-term improvements to land, new tractors and self-propelled harvesters, and by 5 per cent supplements to grants payable under the Farm Improvement, the Horticulture Improvement and, in England and Wales, the Farm Water Supply Grants Schemes. In addition a higher initial allowance was introduced for all plant and machinery for which no investment grant is claimed.

Most readers will be familiar with these investment grants which (apart from the 5 per cent supplements), are payable at the rate of 10 per cent. For expenditure incurred in 1967 and 1968 the rates were increased to 12½ per cent for fixed equipment etc., and 15 per cent for tractors and self-propelled harvesters.

The effect that a claim for investment grant has on the taxation allowances is fairly simple to understand. When an investment grant has been claimed for fixed equipment or for a tractor or a self-propelled harvester, no initial allowance will be made for tax purposes, and the annual writing down allowances will be given only on the net cost of the asset after deducting the investment grant.

It may be helpful to give a brief description of the system of capital allowances i.e., the deductions for depreciation of plant and machinery for tax purposes. Most of the rules are contained in the Capital Allowances Act, 1968.

Capital allowances on plant and machinery are of two kinds. First there is the initital allowance, which is given at the rate of 30 per cent on expenditure on new or second-hand plant (other than motor cars) for which no investment grant has been claimed.

The second is the annual writing down or 'wear and tear' allowance which represents annual depreciation. The annual writing down allowance may be given either on a straight line basis, i.e., a constant proportion of the cost of the asset is written off in each succeeding year, or on a reducing balance basis. In this case an allowance is made each year equivalent to a given percentage of the written down value. The reducing balance method is usually employed; in most circumstances it is more appropriate than the straight line method. The writing down allowance is normally calculated on the written down value of plant in use at the end of the year on which the tax assessment is based (or at the end of the chargeable period for corporation tax purposes). The rate at which the allowance is made varies in accordance with the type of plant and machinery involved.

The following table sets out the annual rate of allowance for certain types of equipment with a note of the rate of allowance given for new machinery items dependent on the expected working life of the asset. The rates of allowance to be used for the reducing balance method and the straight line method are given.

Example of percentage rates of allowances

Machinery of existing types	*Reducing balance (normal) method*	*Straight line method*
	%	%
Electrical installations	15	6¼
Combine harvesters	20	8½
Sugar beet and potato harvesters	25	11¼
Lorries and vans	25	11¼
Sprayers	31¼	11¼
General machinery and implements including portable sheds	15	6¼
Tractors	28⅛	11¼
New types or changes		
Expected working life		
18 years or more	15	6¼
14–18 years	20	8½
Less than 14 years	25	11¼

Many farmers may feel that there are very few machinery items which can be expected to remain in operation for fourteen, let alone eighteen, years and the scrapping of agricultural machinery often causes minor difficulties with the Inland Revenue. There is a case, indeed, for a fundamental revision of the rate structure.

When an item of plant is sold or scrapped, a balancing allowance or balancing charge is made for tax assessment purposes. This is to ensure that the depreciation allowed over the whole life of the asset is equal to the difference between the original cost and the disposal price, whether for scrap or otherwise. An additional allowance is made if the disposal value is less than the written down value; if the asset is disposed of for more than the written down value the balancing charge taxes the surplus realized. There is a proviso that a balancing charge cannot exceed the total allowance previously given for the asset.

A balancing charge may be deferred and deducted from the cost of plant bought to replace the asset that has been sold. Where this is done, however, the initial allowance on the new item is calculated on the net cost of the plant after deducting the amount of the balancing charge.

Perhaps an example is the best way to round off this very brief explanation. (This farmer makes his accounts up to 31st March in each year and there are no changes in the ownership of his farming trade during the period of the example.)

	Combine harvester	*Lorry*	*Combine harvester (investment grant) NOT claimed*
Allowance rate (normal basis)	20%	25%	20%
	£	£	£
Cost price 14.2.69	3000	1500	3000
(10%) Investment grant—received in full—eventually	300	—	—
Net cost	2700	1500	3000
Allowances deducted from profits charged to tax:			
1969/70			
Initial Allowances (30%)	—	450	900
Writing down allowances	540	375 825	600 1500
Written down value	2160	675	1500
1970/71			
Writing down allowances	432	169	300
	1728	506	1200
1971/72			
Writing down allowances	346	126	240
	1382	380	960
1972/73			
Writing down allowances	276	95	192
	1106	285	768
Sale price 14.2.73	900	400	900
1973/74			
Balancing allowance	206 (B.A.)		
Balancing charge		115 (B.C.)	132 (B.C.)

In most cases, therefore, it will be advantageous to claim the investment grant, and at a tax rate of 6*s.* 5*d.* (standard rate less earned income relief for an individual) there is no doubt that grants should be claimed. There may however be cases where, because of an exceptionally high tax rate, for one reason or another the taxpayer will prefer not to claim grant. These cases will be the exception rather than the rule and will depend on the special circumstances to be considered by the farmer's advisers.

27. Lincoln (Kesteven)

A. W. Mardon

GEOGRAPHICALLY, and also in the minds of some people, the county of Lincolnshire embraces vaguely that part of England to the east of the Great North Road between Stamford and Newark and lying on the North Sea side of the Trent between there and the Humber. The area comprises in fact the three independent and autonomous counties of Lindsey, Kesteven and Holland. In Anglo-Saxon times, the area to the north of the Witham was known as the Island of Lindisi while in the south the more heavily wooded area was named Kesteven and the low or hollow land became Holland. Such descriptions are equally applicable today.

Kesteven, more correctly known as the Parts of Kesteven, includes a little over 400,000 acres of excellent farming land stretching almost fifty miles southwards from Lincoln to the ancient town of Stamford. Although the Danes probably planned a single county of Stamfordshire extending through to the Wash, subsequent events led to the establishment of the three administrative centres at Lincoln, Sleaford and Boston serving respectively Lindsey, Kesteven and Holland.

Although Lincolnshire as a whole is generally accepted as one of the premier agricultural areas of England, the pattern of its farming is less familiar than that of many others. Kesteven falls not only between Lindsey and Holland as regards size but also maintains a nice balance between the large cereal farms of the Wolds and the smaller intensive units in the Fens. The total population of the county is only a little over 150,000 people and, although some industry is centred on Grantham and Stamford, agriculture remains the dominant industry.

The main geological feature is a spine of Lincolnshire limestone running down the length of the county. It forms a plateau about 200 feet above sea level in the north, known locally as the Heath, and rises to the highest point in the county near Grantham at an elevation of around 400 feet. Ironstone is worked extensively in the south-west near Colsterworth where a number of farmers have land in various stages of restoration. Westwards the Heath falls sharply away to lias clays, sand and river gravel. Gentle slopes to the east lead through Cornbrash, Estuarine, Oxford and Boulder Clay and more gravel before finally slipping to the alluvium and peat of the Fens after crossing the Roman Car Dyke just above the old shore line.

Extensive schemes completed during the early nineteenth century still play an important part in Fenland drainage. Recently, over two million pounds has been spent in improving the effectiveness of the South Forty Foot Drain which for most of its twenty-one miles divides Kesteven from Holland.

Water is pumped from it at the Black Sluice near Boston by one of the largest installations in the country. Altogether twenty-four new pumping stations secure drainage of the area.

Whilst wheat, barley, potatoes and sugar beet are key crops in the farming system it is a mistake to think of Kesteven as a county dominated by large-scale units. Despite the fact that since 1956 the number of farms below 500 acres has fallen by 25 per cent and those over 1,000 acres have doubled, there are still only sixty businesses of that size. Over half the county is cropped annually with cereals and, while the Heath is ideally suited to large scale barley growing, the stronger land produces excellent crops of wheat.

High fixed costs and the relatively inflexible acreage of potatoes and sugar beet are forcing farmers to seek alternative high output cash crops. Spalding, the centre of the British bulb industry, lies only a few miles to the east of the boundary with Holland and those with suitable soil conditions grow, not only tulip and daffodil bulbs, but also produce gladioli, crocus, dahlias and rose bushes. Vegetable cash crops include carrots, onions, red beet, celery and Brussels sprouts. The relative proximity of large-scale freezing and processing plants down the east of England between Grimsby, Boston and King's Lynn has encouraged interest in various forms of vegetable production. There is a movement among forward-thinking growers to organize themselves into co-operative groups for the marketing of their highly specialized crops. Interest started with the growing of vegetables, especially peas, to supply the large freezers centred around the fishing port of Grimsby. More recent developments include the production of potatoes, not only for canning, but also processing as frozen chips or dehydration as potato flour.

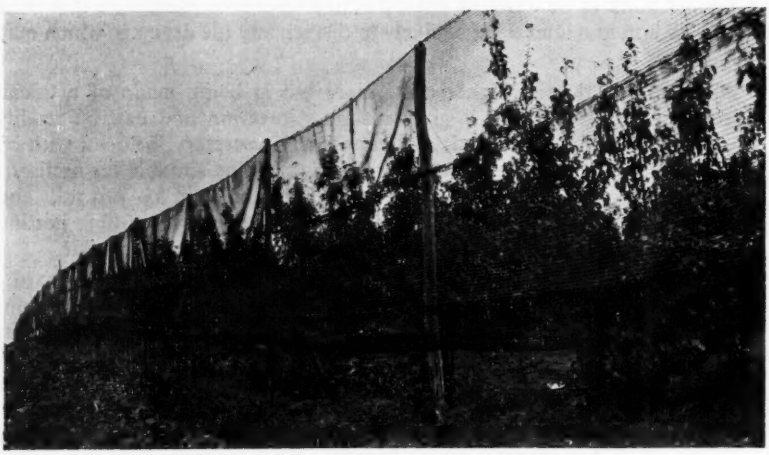
Special requirements and high standards demanded by the rapidly expanding processing industry throw up, not only many stimulating technical problems, but offer exciting possibilities to those growers willing to adapt and meet market demands.

Livestock production is less important than that from arable crops. Nevertheless, a number of large dairy herds are kept, particularly towards the boundaries of Nottinghamshire and Leicestershire. As smaller producers leave the industry, others expand to larger units which maintain the county's dairy herd at a fairly constant level. Historically, Lincolnshire can claim to have native breeds of cattle, sheep and pigs. The Lincoln Red cattle originated from an importation into the county of improved Durham Shorthorn cattle in the late eighteenth and early nineteenth centuries. The Breed Society started weight recording in 1961, some two years before the introduction of official schemes by the Beef Recording Association. Like breeders of Lincoln Longwool sheep, members have supported the export drive by sending stock to many parts of the world.

Lincolnshire farmers instinctively dislike any widespread departure from sound rotations and good farming practice. Although the normal rainfall is only a little over twenty inches per annum, there is an acute awareness of the need to maintain good soil structure. Recently some 'blowing' on very light land has arisen during the early spring, as a result of the strong east winds which are common at that time. The effect of heavy modern equipment and machinery on soil structure is also being watched very closely.

Whilst it would be difficult to single out any one feature as typical of farming in Kesteven, the widespread involvement of the populace in agriculture is almost unique. The local community enjoys with farmers, large and small, a deep common interest in the land.

Windbreaks



P. H. Winch, *Agricultural Land Service. Maidstone*

THE presence of windbreaks as a physical barrier to wind affects the atmospheric structure of temperature, humidity and hence plant processes. The wind pattern behind a windbreak and the degree of protection offered, depends not only upon the dimensions and structure of the break but also on prevailing wind, weather conditions and on features of the surrounding terrain. The need for windbreaks is to protect growing crops from damage effects of excessive drying, cooling and wind frosts; to reduce the damage to fruit blossoms; injury to hop bines, delicate flower crops and widespread windfall of top fruits.

A windbreak is aimed at the reduction of surface wind velocity partly to the windward but chiefly to the leeward. The main influencing factors are *height, penetrability, length and general layout.* To overcome undue turbulence when the wind encounters a barrier it should be moderately permeable to avoid most of the horizontal air stream being deflected upwards. The more open barrier allows a greater proportion of the flow to penetrate. This is a particular factor when considering windbreaks to orchards as it is important that any potential frost pockets should be readily dispersed. Turbulence and eddying in the protected zone are reduced by a permeable windbreak and that part of the air stream deflected over the top of the break will re-establish itself more gradually.

The type of windbreak to use should relate to the crop that is to be protected. Perhaps the most traditional is the high-growing 'thorn' hedge that is side trimmed and which is still found against orchards and hop gardens; but natural breaks of trees can be satisfactory, provided care is taken to select varieties suitable to the soil and environment. Perhaps one of the most common found in the county of Kent is the poplar, mainly because of its rapid growth. However, it should be remembered that the root system of the poplar develops horizontally and thus absorbs from the soil vast quantities of water at a time when most needed by the crops which are being protected. A further point to be watched when planting trees is to make sure that their roots will not, at a later date, be likely to disturb any tile drainage which may be adjacent.

Alternatively, despite higher cost, more use is being made of artificial screening. This is because it gives instant protection and can be readily placed where it is most needed; odd gaps can, if necessary, be dealt with by this method. There are two types of artificial screening suitable for orchards and ground crops. One is an all-plastic mesh, obtainable in 33-yard rolls and the other, a recent innovation in the form of a plastic covered fibre netting which is available in rolls of 100 yards. Both materials are 5 feet wide.

Screens are fixed to a permanent framework which, in the case of orchards, should be 10 feet high in two widths set 5 feet from the ground and therefore finishing 15 feet high, and 5 feet high to ground crops with parallel screens at approximately 16 yards apart, depending on the aspect. In Kent the framework is usually constructed of used, sweet chestnut hop poles, 3–4-inch tip, strutted with butts inserted 2–3 feet into the ground according to soil composition and spaced at 9–12 feet intervals; alternatively, new chestnut poles, butt treated with creosote by the hot and cold method. In between the poles are stretched strands of galvanized wire of 8 gauge to which the mesh or netting is fixed by a fold over the wires top and bottom of the width and interlaced by either hop or plastic string. Because these durable materials are light and flexible they can be easily erected in numerous ways to suit the circumstances. The wire is strained and the straining posts are appropriately anchored at each end.

The site of an artificial screen should be reviewed periodically and the crops investigated to ascertain the influence the screen has in the light of developments and other environmental studies.

Hops also suffer damage from wind and the modern tendency towards higher wirework makes it even more necessary to provide adequate screens. As the bines grow they are liable to be blown off the strings and expensive re-training is necessary. Later still the 'heads' may be snapped off at the top wire and laterals are bruised and broken. The cones themselves become brown and tattered by wind bruising and this effect is always obvious around the edges of exposed gardens and gateways.

Coir netting ('hop lewing') is frequently provided to augment a natural break and is one of the most effective forms of artificial screen producing an effective reduction of windspeed down to ground level over a distance several times its height, but since it is normally put up only as high as the top wire its effect is less than that of a natural shelter-belt of taller growing trees. The limitation of 'lewing' is seen when strong winds occur in June and early July since at this time growth is more open and the wind can get into the garden. Moreover, it is usually fixed to the poles which support the

wirework increasing the total wind resistance and putting an additional strain on the anchors. It is usually put up in June and taken down for storage under cover after hop picking. Under these conditions it will be serviceable for several years. The 'lewing' is obtained in 50-yard rolls with widths of 3, 4½ and 6 feet. All-plastic mesh which is erected in the same manner can also be used but it is not necessary to remove it after the end of each hop-picking season. This applies also to plastic covered netting.

The Ministry's Publications

Since the list published in the September, 1969, issue of *Agriculture* (p. 438) the following publications have been issued.

MAJOR PUBLICATIONS

BULLETIN

No. 162. Sugar Beet Pests (Revised) 14*s.* (by post 14*s.* 10*d.*)
(SBN 11 240462 6)

FIXED EQUIPMENT OF THE FARM LEAFLET

No. 6. Permanent Farm Fences (Revised) 3*s.* (by post 3*s.* 4d.)
(SBN 11 240546 0)

OUT OF SERIES

Farm as a Business No. 3. Aids to Management—Sheep (Revised) 2*s.* 6*d.* (by post 2*s.* 10*d.*) (SBN 11 240943 1)

Report of the Dairy Effluents Sub-Committee of the Milk and Milk Products Technical Advisory Committee (Joint publication of Ministry of Agriculture, Fisheries and Food, Department of Agriculture and and Fisheries for Scotland and Scottish Home and Health Department). (SBN 11 240932 6) (New) 7*s.* (by post 7*s.* 8*d.*)

FREE ISSUES

ADVISORY LEAFLETS

No. 23. Coral Spot (Revised)

No. 284. Potato Cyst Eelworm (Revised)

No. 286. Chrysanthemum Midge (Revised)

No. 440. Stem Eelworm on Vegetables (Revised)
(Formerly Stem and Bulb Eelworm on Vegetables)

The priced publications are obtainable from Government Bookshops (addresses on p. 526) or through any bookseller. Single copies of the above free items are obtainable from the Ministry (Publications), Tolcarne Drive, Pinner, Middlesex, HA5 2DT.

in brief

- **Our food**
- **B.B.C. Farm Management Programmes**
- **Fireblight**
- **Pest Control**

Our food

THE latest figures on food consumption (per head per annum) in the United Kingdom show that over the past few years (1965–68) the pattern has changed very little. Slightly less meat was eaten between 1967 and 1968, reflecting the restricted supply following the major foot-and-mouth epidemic in 1967. This circumstance, however, doubtlessly favoured the consumption of poultry, which increased by 1·5 lb per head to make a total of 20·3 lb per head over the year—the highest recorded since 1961. The annual consumption of eggs and egg products (in terms of numbers of eggs) was static at 273 per head.

Consumption of butter and margarine has remained fairly constant over the past four years but lard and compound cooking fat has lost ground to other edible oils and fats, a change ascribed primarily to the increased use of cooking oils. There seems, too, to be a growing demand for processed potatoes these days, since the consumption of dehydrated, canned, frozen and (notably) potato crisps has shot up in the last three years from 18 lb a head to over 30 lb, whilst that of potatoes fresh from Mother Earth has fallen by about 7 lb a head.

Exhortation to drink more milk has so far gone unheeded. Between 1967 and 1968 consumption dropped by 2·2 pints per head from the yearly *per capita* figure of 250·7 pints in 1967, reflecting in some measure the withdrawal of free milk from secondary schools. We also drank a little less tea in 1968 (8·9 lb compared with 9·1 lb per head in 1967) although no less than in the two previous years. But if milk consumption is down, our liking for cream continues to increase (22 per cent since 1965), and the cheese-board is more in evidence (9 per cent up on 1965). Nutritionwise, we see a long-term tendency for the contribution from protein and fat to increase, and for that from carbohydrate to decline.

B.B.C.—Farm management programmes

THE new Farm Management series of programmes will be starting on **BBC-1 on Thursday, 9th October, 1969, at 12.30 p.m.**

The aim of the ten half-hour programmes which make up the new Further Education series 'Farm Management' is to show the small and medium sized working farmer the best way to keep simple records so that they can take the necessary measures to increase productivity.

The programmes are based on a 280-acre mixed farm. To survive today's economic pressures—with costs of production rising all the time, but with prices often rising at a much slower rate—the farmer must now have a complete business analysis of all his enterprises. This is essential as it enables him to decide what lines he should expand, or even those he should consider dropping. Farm management is a combination of business recording and of good husbandry, of both crops and stock. The series will, therefore, show the advantages of record keeping, and consider all the changes made over a five-year period, with most of the programmes dealing with the practical application of records. There will also be studio discussions with experts on the changes in policy made by the farmer. The type of problems and subjects being considered will be: realizing capital from within the farm; the possible advantages of forming a partnership or company; the ways a farmer can cushion himself against capital gains tax; how to calculate the stocking rate on a farm with

various enterprises; grazing control; co-operation with neighbours in the use of expensive machinery; labour management; incentive to encourage stockmen.

The Ministry of Agriculture, Fisheries and Food have prepared notes to accompany each programme and these can be obtained free from: The Farming Office, B.B.C., St. Catherine's Close, All Saints Green, Norwich, NOR 88B.

Fireblight

FIREBLIGHT, a bacterial disease affecting pear trees and related trees, is an annual hazard to commercial pear orchards in southern and eastern counties of England and Wales. Outbreaks have been detected in some apple and pear orchards in these areas during the last month. Once trees are affected the disease can spread rapidly. Commercial pear and apple growers are advised to inspect their trees at weekly intervals. If they suspect that the disease is present, they should contact a local Plant Health Inspector or N.A.A.S. adviser at once for advice on its control. Only quick action can reduce the risk of spread throughout the orchard.

The Ministry has recently published a leaflet on the history of the disease in this country, its symptoms and methods of control. Copies of this leaflet 'Fireblight (Erwinia amylovora) in Britain', can be obtained, free of charge, from the Ministry of Agriculture, Fisheries and Food, Publications Branch, Government Buildings, Tolcarne Drive, Pinner, Middlesex. HA5 2DT.

Pest control

SOMETHING of the diversity and complex nature of the work of the Ministry's Infestation Control Laboratory becomes clear from the 120 pages of its Report for the three years 1965–67*. In particular it reflects the considerably increased activity of the Laboratory's Chemistry Department in its investigation of the hazards that may attend the use of persistent pesticides in agriculture and food storage. And this has been further emphasized by the recommendations of the Advisory Committee on Pesticides and Other Toxic Chemicals that a scheme for the mandatory licensing of pesticides and veterinary products should be introduced. The amassing of data dealing with the various uses of pesticides and any residual toxicity they may possess is an obvious precursor to reasoned and sound judgments, and a Pesticides Survey Unit was established early in 1966 to examine the field of food storage, in the same way that the Plant Pathology Laboratory has for some years had the agricultural and horticultural uses of pesticides under examination. Surveys so far completed have dealt with the use of pesticides in farm buildings where grain is stored, in wheat flour mills and in bacon factories; and these are currently being extended to include granaries, ships, British Rail and forestry.

Laboratory experiments and field trials continue to evaluate the possible risks of agricultural chemicals to wild birds, and although (to quote the Report) 'as in previous years, the results of chemical analyses have sometimes borne little relationship to the circumstantial reports implicating particular chemicals', instances have been confirmed (e.g., in 1967) of casualties among seed-eating birds when the sowing of dressed cereal seed has had to be held over to the new year because of unsuitable sowing weather in the autumn. Dieldrin was the pesticide most frequently implicated; incidents involving DDT and gamma-BHC were uncommon.

Studies in the behaviour and ecology of such major pests as rabbits, foxes, grey squirrels, rats, mice and pigeons are suggesting new lines of approach to control problems. And the success of the drive against coypu, which by the end of the campaign in 1965 had accounted for no less than 40,461, demonstrates what can be done by a systematic and knowledgeable tackling of a pest problem. This Report certainly presents an impressive record of gathering momentum in field and laboratory against pests of all kinds, without which the threat to our food supplies would be grave indeed.

AGRIC

*H.M. Stationery Office, 14*s.* 6*d.* (by post 15*s.* 4*d.*)

Books

Flora Europaea. Vol. II. (Rosaceae to Umbelliferae.) Edited by T. G. TUTIN *et al.* Cambridge University Press, 1968. Seven guineas.

Four years have elapsed since the publication of the first volume of this ambitious work. The appearance of this second edition, after so brief an interval, must be gratifying not only to the Editorial Committee, but to the many botanists, professional and amateur, who have come to regard the *Flora Europaea* as a trustworthy guide through the labyrinth of European taxonomy and nomenclature. As a product of pan-European co-operation, it must surely be the envy of those who have striven to attain other objectives in the same sphere, often with rather less notable success.

Volume II must have been, in anticipation, a major hurdle: it comprises many of the most intractable problems in the whole range of European taxonomy—the enormities of *Rubus* and *Rosa*, and the lesser, but no less intimidating subtleties of *Alchemilla*, *Potentilla*, *Astragalus*, *Lotus* and *Viola*, not to mention the inscrutable reticence of such prolific but unhelpful groups as *Euphorbia* and the *Umbelliferae*. On the whole, these obstacles have been surmounted with creditable poise and discernment.

No attempt has been made to describe or key out all the Brambles, and few will quibble with this, nor with the decision to ignore the too numerous subspecies, varieties, forms and hybrids of the wild roses. A certain inconsistency is, perhaps, detectable in the treatment of genera: some, as for instance *Cytisus*, being splintered into several groups, whereas *Poterium* and *Sanguisorba*, which surely have as good, or possibly a better claim to generic status, are reduced to subgenera.

In respect of generic limits, every man would appear to be his own master, and here it must be confessed that most of us are sinners, sinking or splitting without overmuch regard for the claims of logic, tradition or utility. Only one other criticism. Do the editors intend to republish the 'Key to the Families of Angiospermae' in every volume of the Flora? I was surprised to meet the key again in the second volume, the more so as I have always argued that such keys, if considered necessary (which is doubtful), should await the completion of the whole work, when it is finally known what families are represented in the Flora. a fact which cannot possibly be ascertained in advance of the event.

R.D.M.

Diseases in Free-Living Wild Animals. (Symposia of the Zoological Society of London. Number 24.) Edited by A. MCDIARMID. Academic Press, 1969. 84*s*.

This book contains the papers and the discussions in a symposium on diseases of free-living wild animals, organized for the Zoological Society of London in 1968 by Dr. A. McDiarmid. The symposium was the first of its kind to be held in the United Kingdom and reflected the growing interest which is being taken in this country in infections of wild life, not only because of their possible effect on man or his domestic animals but also because of their possible significance to the wild animals themselves. In some instances this latter interest may have a self-centred motive when the diseases involve animals used for food or sport, but it does seem that man has at last accepted responsibility for protecting animals against disease. Such infections assume ever increasing significance now that living space is contracting and that more intensive use is being made of the countryside.

Most of these aspects were considered during the course of the symposium which had two objectives: firstly, to bring together information on diseases which has either not been published or is scattered in numerous journals and secondly, to bring together as many workers as possible, no matter how varied their interests.

Among the virus infections considered were foot-and-mouth disease (J. B. Brooksby) arbovirus infections (D. I. H. Simpson), red squirrel disease (A. D. Vizoso), ulcerative dermal necrosis of Salmonids, 'Salmon disease' (J. T. Carbery) and myxomatosis (H. E. N. Vaughan and J. A. Vaughan). It is to be regretted that a section on rabies was not included in view of its potential dangers at the present time.

In the section on bacteria were papers on salmonellosis (Joan Taylor), leptospirosis (G. I. Twigg *et al*), brucellosis (W. J. McCaughey), pseudotuberculosis (N. S. Mair) and mycobacterial infections (J. Deans Rankin and A. McDiarmid).

In the protozoal section two papers were presented on trypanosomal infections; that by E. A. Wells and W. H. R. Lumsden concentrated on infections of man and domestic stock, while that by J. R. Baker concerned wild animals in the neighbourhood of the Serengeti National Park. S. F. Barnett and D. W. Brocklesby discussed some piroplasms of wild mammals and C. M. Herman blood protozoa of birds. There were also papers on ectoparasites (D. K. Blackmore and D. G. Owen), endoparasites (A. M. Dunn), mycotic infections (P. K. C. Austwick) and neoplasms (A. R. Jennings).

The collection has been well edited, but a few minor errors or inconsistencies were noted. For example, the Greek tortoise is *Testudo graeca*, not 'groeco', and in the paper on Salmonella, three different plurals are used—salmonella (page 68), salmonellas (page 64) and salmonellae (page 64).

D.A.H.

Cattle Fertility and Sterility. (2nd Edition). S. A. ASDELL. J. and A. Churchill, 1968. 75*s*.

The second edition of this book follows very closely the first, published in 1955, and the apparent increase in length is due to a change of type rather than to the inclusion of much additional material. The book has its origin in three lectures given at the Royal Veterinary College during 1953, and this may have set the pattern and style of the work, which is concise, readable and logical. Professor Asdell may have attempted to pour too much into a small pot but since the book is not aimed at the specialist reader this can be forgiven. There may be a hidden advantage in that the more nebulous hypotheses that flourish in the world of cattle fertility have been ignored or are replaced by sound reasoning.

The author admits that much of the book has been drawn from his own experience and that of his colleagues at Cornell University and this gives the incorrect feeling of a somewhat parochial outlook.

The first nine chapters deal with the anatomical and physiological aspects whereas the final three are concerned with infertility and sterility. Here the author packs an amazing amount of detail into a mere eighty pages and succeeds in keeping the subject in perspective. This means that all aspects are not dealt with adequately and so it is not difficult to find apparent minor omissions.

The first edition was a successful and useful volume so the second, which has been improved and has not become in any way dated, is also of value. It should be realized that this book is most suitable for veterinary and animal husbandry students, animal husbandry advisers and progressive stockowners. The more advanced worker will find the book helpful in that at the end of each chapter there is in addition to the main references, suggestions for supplementary reading.

D.L.S.

British Sheep. (Revised Edition 1968). NATIONAL SHEEP BREEDERS ASSOCIATION. 20*s*.

The N.S.B.A. has, without doubt, fulfilled an obligation to its member societies by publishing this attractive and well-illustrated handbook describing some forty-eight pure breeds and five important crosses found in this country today.

Although it is cheaper to buy the book than to write to individual societies for similar but free brochures, I object to paying for breed propaganda and feel that the N.S.B.A. has missed an opportunity to include some unbiased objective reports on at least the performance of some breeds and crosses. Time has shown that all breeds are not equal in adaptability, productivity and profitability and the popularity of certain types may even be noticed by the style and tone of their societies' contributions.

The magic spell woven from such characteristics as shape of head, curl of horn and colour of skin is no longer sufficient to sell a breed but neither are slick half truths about lambing percentage, liveweight gains etc. It seems that the uninitiated in sheep matters must wait a few years for a body such as the Meat and Livestock Commission to collect some worthwhile information.

Many breed societies claim that a large proportion of the carcase weight of their lambs is found in the more valuable joints. While we would all prefer a lamb with 'four' legs it appears from recent work that the apparent superiority in cutting out of 'ideal carcases' is largely due to a higher fat percentage rather than to more lean meat in those joints. If these findings are confirmed, societies may have to think afresh new objectives for their breeds remembering

that 'fat' lambs are no longer required.

An unexpected but fascinating account of Soay sheep abandoned on St. Kilda since 1932 provides valuable clues to the breakdown of more sophisticated sheep under intensive grazing conditions. Similarly, the section on the marketing of wool, prices and subsidies, British breeds overseas and a glossary of sheep terms rapidly disappearing, compensate for the shortcomings of the breed descriptions.

G.L.W.

books received

Degradation of Herbicides. Edited by P. C. Kearney and D. D. Kaufman. Marcel Dekker, 1969. £8 18*s*.

Economic Aspects of Co-operative Livestock Marketing. Report No. 171G. S. J. Rogers and E. D. Sargent. University of Newcastle upon Tyne, 1969. 10*s*.

Annual Report 1968. Meteorological Office. H.M.S.O. 11*s*.

Long Ashton Research Station Report 1968. University of Bristol. 20*s*.

Annual Report 1968. The Grassland Research Institute. Copies from the Institute, Hurley, Maidenhead, Berks. 15*s*.

Farm Management Pocketbook. (3rd Edition). John Nix. Copies from Publications, Department of Agricultural Economics, Wye College, Ashford, Kent, 1969. 10*s*. (including postage).

Types of Farming in Yorkshire. Farmers' Report No. 178. A Study Based on 234 Farm Accounts in 1967-68. University of Leeds, 1969. 3*s*.

Some Problems in the Economics of Milk Transport. Marketing Report No.2. A. J. Wynne. University of Leeds, 1969. 5*s*.

Sources of Increased Income From Milk Production. Farmers' Report No. 179. University of Leeds, 1969. 3*s*.

ACKNOWLEDGEMENT OF PHOTOGRAPHS

Front cover *Farmers Weekly*. P. 479 Welsh Planting Breeding Station. P. 484 Commercial Camera Craft. Pp. 493 and 494 Pea Growing Research Organisation Ltd. Pp. 506 and 508 *Poultry World*. P. 509 Jenny Cullington.

Printed in England for Her Majesty's Stationery Office
by Hull Printers Limited, Willerby, Hull, Yorks.

(K89) SBN 11 720766 7

OFFICIAL APPOINTMENTS

General agriculturists and agricultural specialists of many kinds are frequently required in the effort to match the large demand from the developing countries. The vacancies advertised below are a selection from the many openings which exist now. While they are being filled, other vacancies are arising.

Salaries within the ranges quoted are assessed on qualifications and experience; and the terms of most appointments include free or subsidised accommodation, education grants, family passages, good leave on full pay, etc. A contributory pension scheme is available in certain circumstances.

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To take charge of the extension service. He must have a degree in agriculture with considerable practical experience in running a large extension section in an African country. Salary Rand 4980 (£2,906) p.a. Terminal gratuity 25%, normally tax free. An inducement allowance, normally tax free, of £660 p.a. is also payable. Contract 2–3 years.

UGANDA — Entomologist

To carry out surveys and conduct research into the pests of crops and stored produce and on cotton, coffee and cocoa crops in particular; to advise on control measures. He must have a good honours degree in Natural Science or equivalent and at least two years' postgraduate training in agricultural entomology. Salary £Ugandan 798—1,791 (£Sterling 931—2,089) p.a. plus an inducement allowance, normally tax free, of £700—958 p.a. Terminal gratuity 25%. Contract 21–27 months.

BRUNEI — Agricultural Officers

To be in charge of sub-districts which will include one or more agricultural stations, to lay out and supervise experimental and/or demonstration plots and advise and give lectures to groups of farmers. He must have a degree in agriculture with tropical experience. Salary £1,992—3,526 p.a. Tax free gratuity of 12½% of salary. No local income tax. Three years contract.

LESOTHO — Pasture Research Officer

For basic research into veld and pasture management including the establishment, fertilization and management of planted pastures and for experimental techniques involving travelling within the country. He must have an honours degree in agriculture or botany with experience in pasture research work especially in Africa. Salary Rand 2,172—4,800 (£1,267—2,800) p.a., plus an inducement allowance, normally tax free, of £288—528 p.a. Terminal gratuity 25%. Contract 2 years.

OFFICIAL APPOINTMENTS

CAYMAN ISLANDS — Deputy Director, Mosquito Research and Control Unit

To assist in all aspects of research and control of biting flies, in the running of a small multi-disciplined unit with special responsibility for insecticide testing and field trials using ground and aerial methods. Also for insecticide formulation and the execution of abatement measures. He must be 25–40 and have a degree in entomology with practical experience in aerial applications and insecticide testing. The ability to handle labour and undertake administrative duties is desirable. Salary £2,500—3,000 p.a., plus an inducement allowance, subject to revision, of £600—750 p.a. Terminal gratuity 25%. No income tax. Contract 2 years.

BOLIVIA — Agronomist

Required in the British Tropical Agricultural Mission to plan field trials designed to translate soil survey and soil analysis information into crop responses to existing and applied nutrients. He must have a degree in agriculture or natural science with experience in the design, execution and evaluation of field trials in the tropics. Salary £1,600—3,000 p.a. subject to British income tax, plus a variable tax-free overseas allowance of £730—1,270 p.a. Contract two tours of 18 months.

MALAWI — Agricultural Research Officer

To act as personal assistant to the Chief Agricultural Research Officer on the professional administrative side of the Agricultural Division Research Branch with duties including collection and correlation of experimental records and reports, initial editing and compiling of the Agricultural Research Annual Report, preparation of special subject matter reports and handling of routine correspondence. He must have a degree in agriculture or allied subject, with practical experience in field experimentation; experience in the writing of reports for publication is desirable. Salary £1,475—2,600 p.a. Terminal gratuity 25% on completion of tour of not less than 30 months. A supplement of £216—276 p.a. is also payable. Both gratuity and supplement are normally tax free. Contract 2–3 years.

EAST AFRICAN COMMUNITY — Soil Chemist

To carry out research and investigation into problems of soil fertility and plant nutrition relevant to the problems of crop production increases in East Africa. He must have a good honours degree in agricultural chemistry (soil science and/or plant nutrition) *or* a degree in agriculture and two years postgraduate training in soil plant nutrition chemistry *or* an M.Sc. or Ph.D. in these fields. A knowledge of routine soil and plant sample analysis methods is essential. Salary £E.A. 798—2,121 (£Sterling 931—2,474) p.a. plus an inducement allowance, normally tax free, of £Stg. 700—1,025 p.a. Terminal gratuity 25%. Contract 2 years.

If you wish to apply for any of these appointments, or you are interested generally in an appointment overseas, please write giving your full name, age and brief particulars of your professional qualifications and experience to the:

Appointments Officer
MINISTRY OF OVERSEAS DEVELOPMENT
Room 330a, Eland House, Stag Place,
London, S.W.1.

MINISTRY OF OVERSEAS DEVELOPMENT